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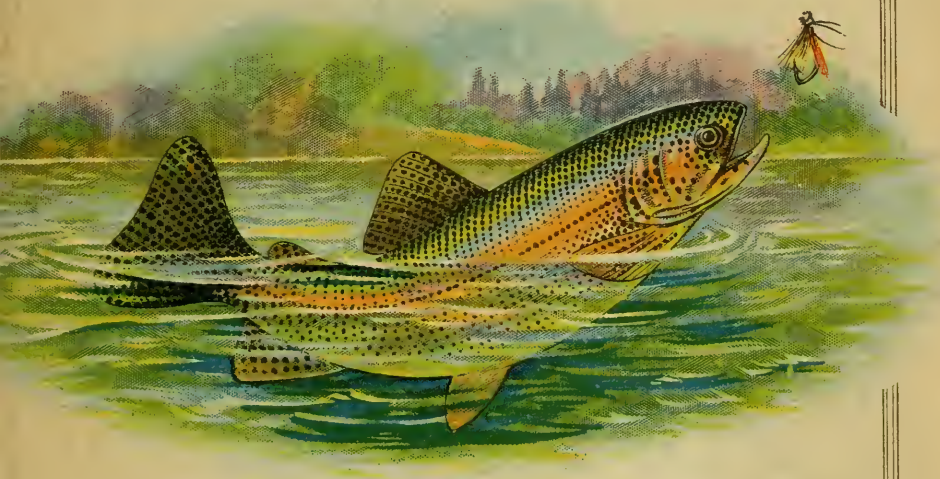
STATE OF CALIFORNIA

FISH AND GAME COMMISSION

TWENTY-EIGHTH BIENNIAL REPORT



For the Years 1922–1924

CALIFORNIA STATE PRINTING OFFICE
FRANK J. SMITH, Superintendent
SACRAMENTO, 1924

34744

STATE OF CALIFORNIA

FISH AND GAME COMMISSION

TWENTY-EIGHTH BIENNIAL REPORT

For the Years 1922-1924

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FRANK J. SMITH, Superintendent
SACRAMENTO, 1924

34744

BOARD OF FISH AND GAME COMMISSIONERS.

Commissioners appointed by the Governor, by and with the consent of the Senate. Term at pleasure of Governor. No compensation.

F. M. NEWBERT, President_____Sacramento
M. J. CONNELL, Commissioner_____Los Angeles
G. H. ANDERSON, Commissioner_____San Jose

GEORGE NEALE, Executive Officer_____Sacramento
J. S. HUNTER, Assistant Executive Officer_____San Francisco
R. D. DUKE, Attorney_____San Francisco

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GEO. NEALE, Executive Officer
Forum Building, Sacramento
Phone Main 4300

SAN FRANCISCO DIVISION.

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J. S. HUNTER, Assistant Executive Officer
Postal Telegraph Building, San Francisco
Phone Sutter 6100

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M. J. CONNELL, Commissioner in Charge
EDWIN L. HEDDERLY, Assistant
Pacific Finance Building, Los Angeles
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W. H. SHEBLEY, In Charge_____Sacramento

DEPARTMENT OF COMMERCIAL FISHERIES.

N. B. SCOFIELD, In Charge_____San Francisco

DEPARTMENT OF EDUCATION, PUBLICITY AND RESEARCH.

DR. H. C. BRYANT, In Charge_____Berkeley

FRANK M. NEWBERT, President.

M. J. CONNELL.

GEO. H. ANDERSON.

GEORGE NEALE, Executive Officer.

BOARD OF FISH AND GAME COMMISSIONERS.

FIG. 1. Ducks—Pintail, widgeon and mallard, which have been feeding in nearby rice fields. Photographed on Butte Creek, Sutter County, California, January 18, 1924. Photograph by George Thompson.

LETTER OF TRANSMITTAL.

Sacramento, California,
September 1, 1924.

His Excellency, FRIEND WM. RICHARDSON,
Governor of the State of California,
Sacramento, California.

SIR: In fulfilment of legal stipulation, we hand you herewith a biennial report of the activities and accomplishments of the Board of Fish and Game Commissioners of the State of California and trust that it will meet with the approval of yourself and of the members of the legislature. As in the past, there will be found a summary of accomplishments, reports of the various departments and, in the appendix, a complete statistical statement.

Yours truly,

GEORGE NEALE,
Executive Officer.

ACCOMPLISHMENTS IN BRIEF.

Both a land and a sea patrol maintained as a means of limiting violations and conserving fish and game resources.

Over 2700 arrests for violations of the fish and game laws made.

More than fifty-six and one-half million trout and nearly thirty-five and one-half million salmon reared in state hatcheries and planted in the streams of the state.

A new stock of eastern brook trout obtained from the east for the state's hatcheries and thousands of the resultant fry planted in lakes and streams.

Two shipments of Mackinaw trout (the largest trout in North America) eggs secured and hatched successfully and the resultant fry planted in Clear and Eagle lakes.

Supply of cutthroat trout secured from the Rocky Mountain region for planting in north coast streams.

Policy of building small hatcheries to supply local streams, thus eliminating long hauls, continued.

The pond system at the Mount Shasta Hatchery developed so that the brood fish now furnish 10,000,000 eggs annually.

Numerous surveys made preliminary to the erection of fishways over dams to allow fish to reach their spawning grounds.

Inspection of 253 screens in irrigation ditches and surveys looking toward the installation of 142 others made.

Many cases of pollution by sawdust and oil remedied.

The most dependable statistics as to the monthly and annual take of fishery products taken anywhere in the world regularly compiled.

State Fisheries Laboratory maintained with staff engaged in fishery research. Foretelling the catch of fish and means of discovering depletion are being made possible through these investigations.

A thorough investigation of the effect of the purse seine fisheries made and recommendations offered.

Possibility of foretelling catch of sardines proved by a scientific investigation.

Marking experiments on salmon have proved the parent stream theory and valuable data as to the age and rate of growth have been obtained.

Control of the worst enemy of the deer, the mountain lion, continued.

Special patrol and permanent boundary signs given game refuges.

Lectures, talks in schools, newspaper items, magazine articles and educational work in summer resorts featured the educational and publicity campaign.

Quarterly publication acquainting people with the activities and accomplishments of the Commission regularly issued.

Saving of migratory fish in Klamath River by creating a fish reserve and blocking the move to erect a 250-foot dam near the mouth of the river championed and an initiative measure placing it on the ballot for decision by the people promptly secured.

Refilling of Lower Klamath Lake to restore breeding grounds for waterfowl advocated.

Drainage of Lake Earl in Del Norte County opposed on conservation grounds.

Many deer saved from death in a large power ditch on the American River by quick action.

CONTENTS.

	Page
LETTER OF TRANSMITTAL	7
ACCOMPLISHMENTS IN BRIEF	8
TWENTY-EIGHTH BIENNIAL REPORT	9
Introduction	9
Personnel	9
Finances	9
Value of Fish and Game Resources	10
Law Enforcement	11
Fish Culture	13
Commercial Fisheries	13
State Fisheries Laboratory	14
Education and Publicity	15
State Fair Exhibit	16
Mountain Lion Control	17
Fish and Game Protective Associations	17
Game Conditions	20
Fish Conditions	20
Problems	22
Acknowledgment	24
DEPARTMENTAL AND DISTRICT REPORTS—	
Department of Fish Culture—*W. H. Shebley*	25
Department of Commercial Fisheries—*N. B. Scofield*	48
State Fisheries Laboratory—*W. F. Thompson*	56
Department of Education, Publicity and Research—*H. C. Bryant*	71
Sacramento District Office—*Geo. Neale*	77
San Francisco District Office—*J. S. Hunter*	79
Los Angeles District Office—*E. L. Hedderly*	82
APPENDIX—	
Fish Distribution by Counties	87
License Sales	94
Violations of the Fish and Game Laws	98
Seizures of Fish, Game and Illegally Used Fishing Apparatus	100
California Fishery Products	101
Nativity of Licensed Commercial Fishermen	108
Lion Bounties	110
Financial Statement	111

TWENTY-EIGHTH BIENNIAL REPORT.

INTRODUCTION.

To properly administer the fish and game resources of a great state like California is at best a difficult undertaking. With forces of destruction to be fought at every turn, new problems arise daily. But with finances in a more settled condition, and with the confidence that the administration, the sportsman and the conservationist have given us, our burden has been lightened and our belief in the worthwhileness of conservation work constantly strengthened. With this review of accomplishments in which the perplexities are overshadowed by the final attainments, the Commission is ready to set its face toward the future with renewed energy and optimistic outlook.

PERSONNEL.

One change in the personnel of the Commission was occasioned on December 12, 1922, when George H. Anderson of San Jose was appointed a Fish and Game Commissioner to succeed Mr. E. L. Bosqui of San Francisco.

During the biennium death has claimed five valuable employees, two of them victims of accidental death: W. C. Fassett, superintendent of Fort Seward and Ukiah hatcheries; John J. Barnett,* Deputy Fish and Game Commissioner; James S. White,* Deputy Fish and Game Commissioner; S. L. N. Ellis, Deputy Fish and Game Commissioner; Earle Downing, assistant, Commercial Fisheries Department; Lloyd V. Evins, assistant, Department of Fish Culture; Mrs. Lulu Creasey, secretary to the executive officer.

FINANCES.

The decision of the Supreme Court of California in the recent case of *Board of Fish and Game Commissioners* vs. *Ray L. Riley, State Controller, etc.*, 67 Cal. Dec. 581, has had the effect of entirely relieving the very critical situation with respect to the funds and activities of the Fish and Game Commission owing to "frozen" funds in the state treasury.

This important case had its inception in the application on the part of the Fish and Game Commission to the Board of Control and to the Governor for permission to create a deficiency and to draw upon the special fish and game preservation fund in the state treasury for its payment. This action was taken in conformity with the provision of section 680 of the Political Code, which purported to authorize the Board of Control, with the approval of the Governor, to create such deficiency and to order the payment of claims arising therefrom out of whatever special funds were in the state treasury applicable to such uses. At the time this application was made the special fish and game preservation fund in the state treasury amounted to approximately the sum of $280,000. The Board of Control passed an order in accord with such application and Governor Richardson approved the same, but the

State Controller, in order that he might be perfectly protected in his allowance of the claim thereupon presented by the Fish and Game Commission in accordance with said order, insisted upon a decision of the Supreme Court justifying and commanding such allowance. The Fish and Game Commission thereupon brought this proceeding before the Supreme Court seeking a writ of mandate to compel the State Controller to approve and allow its claim. The matter was presented to the Supreme Court *en banc* and the court handed down its decision thereon upon June 12, 1924.

The opinion which was written by Mr. Justice Richards and concurred in by all the members of the court reviews exhaustively the history of the creation of the special fund of the Fish and Game Commission and of the legislation relating to the use of said fund. It also reviews the several recent decisions of the Supreme Court interpreting and applying the provisions of the budget amendment and of the budget bill. It holds that section 680 of the Political Code has application to such cases of urgency as this and to the relief of self-supporting boards and commissions having special funds derived from fees, fines and collections and devoted to the particular activities of such boards and commissions. It is needless to say that the decision of the Supreme Court in this important case has given widespread satisfaction.

The sole support of the Fish and Game Commission's work is dependent upon licenses paid by hunters and anglers and by the fines imposed on violators. Although there has been some increase in the number of licenses sold in the past two years, yet funds are not adequate for necessary conservation work. A deficiency appropriation allowed by the Governor and State Board of Control prevented a serious handicap to the work pending a court decision which released the "frozen funds" of the Commission. A complete itemization of the income and expenditures will be found in the appendix.

Most states have found it necessary to increase the license fees to properly administer natural resources. California, even against pressure by the anglers of the state, has maintained its nominal license fee. However, the increasing demand for a greater output from the hatcheries and for better patrol makes it advisable to recommend a special license for deer and an increased angling license fee.

VALUE OF FISH AND GAME RESOURCES.

Following the present tendency to try and estimate the actual value of fish and game resources the following is offered. Nearly a half million hunting and angling licenses are issued annually. If each licensee spent an average of $100 somewhere near $50,000,000 is expended in the pursuit of fish and game. Add to this sum the $25,000,000 valuation of the output of the commercial fisheries and we have a total of $75,000,000. Cut this for safety to $60,000,000 and we have a conservative estimate of the business created yearly because there is game and fish available to the sportsman, and fish resources in the sea. This business is well distributed throughout the state and there are few business men who do not profit therefrom. And this business has been built up on a "taxation by participation" license plan and is not supported by general taxation.

FIG. 2. California's Game Refuges in 1916. (See Fig. 3.)

LAW ENFORCEMENT.

That the wardens have been active in bringing the violator to justice is evidenced by the increased number of arrests. During the year 1923, 338 more arrests were made than during the previous year, and 457 more arrests were made in the past two years than in the previous biennium. An encouraging increase in the percentage of convictions, which exceeds 97 per cent, has been noticeable and $17,428.25 more in fines went into the fish and game protective fund than in the year 1922. Violations of the deer laws and of the bag limit laws continue to bring the largest totals in fines.

There has been a laudable tendency on the part of judges to be less lenient with fish and game law violators, with the result that jail sentences and heavy fines were often given. In 1923-24, for the first time, the jail sentences amounted to more than 1500 days, reaching a total of 4565 days.

Material increase in the warden service commensurate with the large land and water areas of the state is urgently recommended.

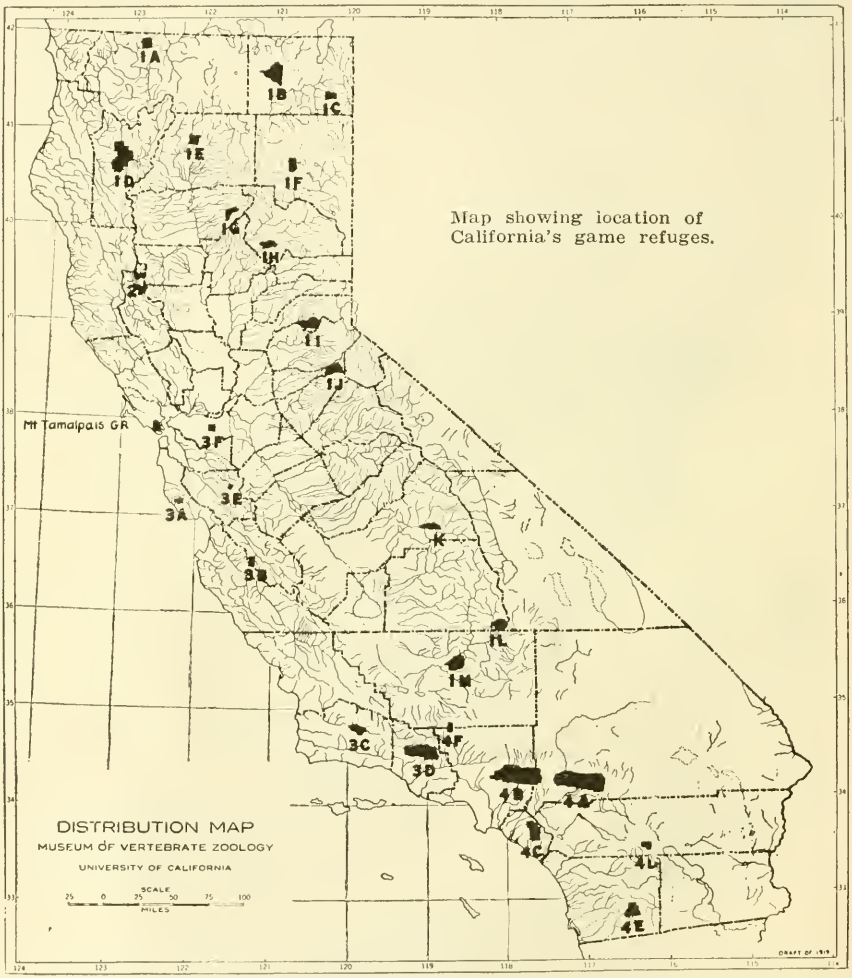

FIG. 3. California's Game Refuges in 1924. (See Fig. 2.)

A COMPARISON.

On the accompanying map will be found interesting comparisons as to the income, expenditures and activities of the various state fish and game commissions. Considering the area and the wild life resources of the state, the sum expended on patrol and on other work of the California Commission is not adequate. A comparison of the patrol expense per square mile of territory in all the states from which records were obtainable shows that California expends $0.64 as against New York's $6.60, Massachusetts' $8.44, Wisconsin's $2.60, Illinois' $3.35 and Missouri's $1.06. Even the Pacific coast states of Oregon and Washington show $0.71 and $1.13 respectively. Texas appears to spend less than all—but 3 cents per square mile of territory.

FISH CULTURE.

During the past two seasons the output of the state's hatcheries has been greater than that of any similar period since the beginning of fishcultural operations. The total trout fry planted reached 56,527,105, and of salmon fry, 35,495,550. All available hatcheries and egg-collecting stations were operated during the biennium. Work was handicapped at some of them because they are still operated under tents, pending the construction of permanent hatcheries.

With an ever growing demand for a larger output of fry, the fish-cultural department looks with alarm at the possible destruction of the best source of egg supply left for the hatcheries in the state—the Klamath River. The building of a 250-foot dam can only mean the destruction of the run of king salmon and sea-run trout which has for several years furnished our state hatcheries with practically all of the salmon eggs and a large majority of the trout eggs. Proper stocking of the streams of the state is absolutely dependent upon the saving of the Klamath River as a fish reserve and the building of more hatcheries.

Worthwhile additions to the stock of fish in the state have been made. A quarter of a million cutthroat trout eggs from the Rocky Mountains were received, hatched, and planted in the streams of the northwest coast region. Eighty thousand eggs of the Mackinaw trout from the Great Lakes were obtained and resultant fry successfully planted in Clear and Eagle lakes. A fine, pure strain of Eastern brook trout was secured for the state through the exchange of a million Loch Leven eggs for a million eggs of this species with the New Jersey Fish and Game Commission.

Screen and ladder surveyors report difficulty in enforcing installation of fishways and of screens and, in many instances, legal proceedings have been necessary. Too often a dry year furnishes an excuse for not providing the fishway with sufficient water to make it usable. The idea seems to be prevalent that water for irrigation and power is more valuable than that used for saving fish life.

Recommendations include:

1. Legislation requiring a sufficient flow of water in a stream to maintain fish life.
2. Better means to force installation of screens and fishways.
3. Increased financial support for the building of new hatcheries and the enlarging of the pond system.

COMMERCIAL FISHERIES.

The fisheries of the state have made a distinct recovery from the post-war slump. In both weight and value, the catches the past two years exceed those of 1920. The total pack at the canneries amounted to 1,981,027 cases in 1923 as against 831,232 cases in 1921. A notable increase in such fish products as smoked salmon, dried squid and salachini is indicated. Dried squid reached the quota of 99,000 pounds. Fish meal and fish oil, by-products of the canneries, also showed a notable increase—nearly 3000 tons in the case of fish meal between 1921 and 1923, and over 6,000,000 gallons in the case of fish oil. The total value of the catch shows an increase of more than eight and a half millions of dollars in the same period of time. In spite of the fact that the value of the plants decreased nearly a million and a half,

there was an increase in the number of those employed in the fisheries. A compilation showing the nativity of fishermen shows 1032 as citizens out of a total of 4123, with 106 unreported as to nativity. There was a decrease in the take of both albacore and salmon in 1923 over that in 1921. On the other hand, the take of barracuda, shad and mackerel was increased and sardines showed a gain of 170 per cent.

The most important problem confronting the Commercial Fisheries Department has been the regulation of the amount of sardines used by the reduction plants. The Fish Conservation Act has been found difficult to enforce and should be amended. The determination of "unavoidable" waste is exceedingly difficult. The amount of food fish to be utilized in making fish oil and fertilizer should be definitely stated in the law, a violation should be a high misdemeanor and the goods manufactured in violation of the law should be subject to seizure by the state.

Sentiment against the purse seine fishery appears to be based on the ancient objection that a new method or appliance upsets the old order of things. Investigation has shown that, properly regulated, this fishery is a worthwhile development and does not necessarily endanger the supply of food fishes concerned.

Striped bass and shad now have sufficient protection in that these species are given a closed season of two and one-half months. This law makes the season for striped bass the same as that for shad.

The salmon has had insufficient protection. A flaw in the law passed by the last legislature made it impossible to eliminate ocean trolling during the months when many immature fish are caught. Investigations have shown that ocean trolling for salmon causes the destruction of many immature fish and has shown exactly the season when mature fish are to be taken by this method. This fishery has constituted an added drain on the salmon supply and should be definitely restricted to a short season. Washington and Oregon have stopped both trolling and purse seine fishing for salmon and they urge this state to do likewise.

There is great need for an additional patrol boat for the northern section of the state. Although the south is cared for, no seagoing vessel is at present available in the northern part of the state for the enforcement of salmon and crab laws.

As a result of the salmon investigation it has been possible to fix accurately the times of year which should be closed to salmon fishing in the sea in order to prevent the destruction of immature fish. Extensive marking experiments have shown the range at sea of salmon and furnished knowledge of the age and rate of growth. Progress is reported on both the albacore and sardine investigations.

STATE FISHERIES LABORATORY.

Although handicapped by a loss of members of the staff, the State Fisheries Laboratory has been able to bring to completion the first part of the sardine investigation and to add valuable data in connection with the albacore investigation. Several members of the staff, being offered better positions, left the service. Their places have now been filled and, in addition, two assistants have been appointed under a

cooperative agreement with the Federal Bureau of Fisheries. Most of the staff is busily engaged in gathering statistics and in compiling them.

The main conclusions in the sardine work are as follows:

1. In order to have an accurate picture of the commercial catch, it is necessary to take samples at least twice a week.

2. Studies of fluctuation show this phenomenon to be due to one of two factors:

(*a*) Presence of dominant age groups which may appear in cycles of several years.

(*b*) Diminution due to relatively unsuccessful spawning. No regularity in this instance has been discovered.

3. Reliable forecasts of the commercial catch can be made as a result of statistical study.

4. From available statistics, overfishing can not be readily detected in time to prevent depletion.

5. Since sardines are the source of food for albacore, barracuda, sea bass and tuna, the effect of overfishing would be far-reaching.

Further study of the albacore emphasizes the fact that migrations are not concerned in the peculiarities of the fishery. So-called "runs" are not the result of migrations, but the result of schools already present which begin to take bait at the surface.

Studies have shown that albacore 21½ inches in length are just completing their second year; those averaging 27 inches in length are finishing their third year; and those 38 to 40 inches in length are in their eighth year or over.

The purse seine investigation, when completed, brought out some interesting facts. Up to 1915 there was but one purse seine boat; thereafter, five were in service, and by 1920, over 100 boats were being utilized in the fishery. Blue-fin tuna are taken only by the purse seine boats, and the winter supply of barracuda, yellow-tail, and white sea bass is largely dependent upon this part of the fishery. In fact, over one-half of the fish reaching the fresh fish markets of Los Angeles harbor is a product of this fishery.

Attention is called to the fact that the grunion, the life history of which was worked out by the laboratory, will sooner or later need protection as grunion fishing is a popular sport on the beaches of southern California.

This year will see added to the files the fifth successive annual statistical record of the daily catch. The total take by locality has been published quarterly. These statistics are more complete than those collected by any other government and will give a dependable comparison of abundance in successive years, a fundamental need in the proper development of fisheries. In addition, biological data as to the varying composition of the catch in regard to sex, size, and other features, has been assembled.

EDUCATION AND PUBLICITY.

The Department of Education and Publicity was very active during the past biennial period, as shown by the report submitted. Many more people were reached through the medium of lectures than in any previous biennium. The work in the summer resorts has proved par-

ticularly productive in the building of a favorable sentiment. Thousands of people are reached at a time when they are most susceptible to information on fish and game and, with emphasis placed on first-hand information, conservation ideas are easily instilled. Schools, boy scout organizations, men's service clubs and groups of every kind have been reached by means of lectures, motion picture displays and literature. The quarterly magazine, California Fish and Game, has continued to carry to its readers reliable information regarding the activities of the Commission and the conservation program of the state. This publication is used regularly in high school classrooms and the call for it from the sportsmen who support the work of the Commission is continually growing. Wide publicity has been secured through the medium of newspapers and magazines.

STATE FAIR EXHIBIT.

Each year the Commission has made an attractive exhibit at the State Fair in Sacramento. The permanent exhibit comprises a great panorama of the Sierra with wonderful lighting effects to show dawn to daylight and sunset to night. Cloud effects and a thunder storm were very realistic. On those days when the attendance was the greatest a count showed 1500 persons, per hour, viewing the exhibit.

Aquaria contained the different species of trout and all fresh water fishes found in the Sacramento region. Golden trout from mountain lakes at an elevation of 10,000 feet, after a journey of nearly a thousand miles by pack train, truck and railroad, were on display. Baby trout just hatched from the eggs and baby salmon were to be seen in the small model hatchery.

Those who visit the State Fair can not help but be convinced of the extensive work being carried on by the Commission in caring for and conserving the fish and game resources of the state. The following letter expresses the appreciation of the directors of the State Fair.

CALIFORNIA

STATE AGRICULTURAL SOCIETY

Sacramento, Cal.

September 9, 1922.

California Fish and Game Commission,
Sacramento, Calif.
Gentlemen:

We, the Board of Directors of the California Agricultural Society, take this opportunity to thank you for the beautiful and educational display of the work of your commission made at the State Fair in 1922; particularly do we wish to commend the enterprise of the commission in placing such a large and comprehensive exhibit. We trust this has given the people of California an idea of the importance of the work of the Fish and Game Commission.

On every hand we have heard favorable comment upon your educational features and we sincerely hope that when the Fair opens next year you will be with us again with an equally attractive display.

Again thanking you and assuring you of our desire to cooperate with you in the years to come, we remain,

Sincerely yours,

State Agricultural Society,
H. A. Jastro,
President.

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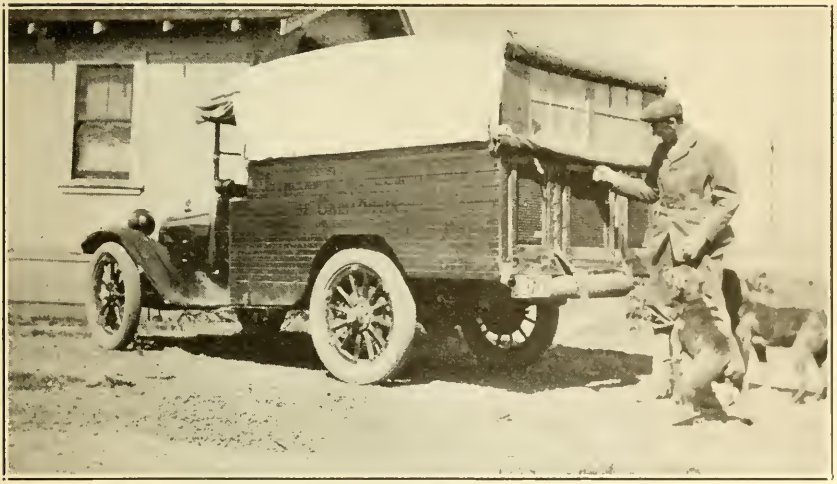


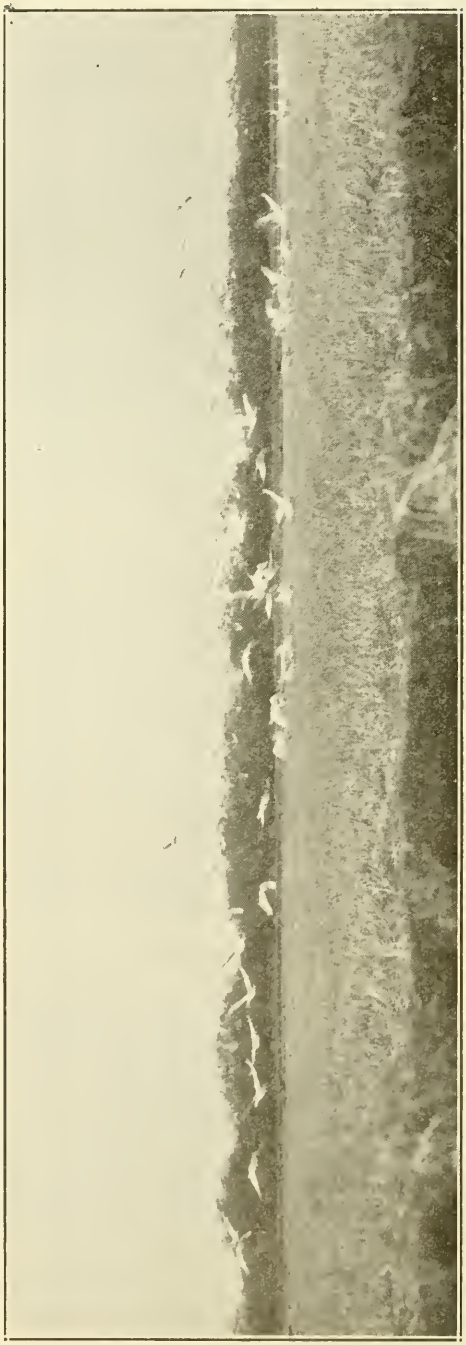
FIG. 4. Jay Bruce, State Lion Hunter starts on a trip. Photograph by Mrs. J. Bruce.

MOUNTAIN LION CONTROL.

During the past two years state lion hunter Jay Bruce, secured sixty lions of which 34 were males, and 26 females. Of this number fourteen were animals less than a year old. Many of the lions (49 in all) were taken in or near game refuges, localities which are worked consistently because of the direct relation to deer conservation. It is believed that the total average lion population of the state has been reduced about 100 as a result of the activities of the state lion hunter. Complaints of the depredations of bears have been consistently investigated but no reliable evidence has been obtained that stock had been killed by them. However, frequently there is evidence that bears have fed upon stock killed by other predatory animals than bears. A complete summation of the lion bounties paid will be found in the appendix.

FISH AND GAME PROTECTIVE ASSOCIATIONS.

The staunchest kind of support for conservation measures comes from the twenty or more fish and game protective associations of the state. Could this favorable sentiment be unified in one great state organization the sportsman's interests could be better cared for. The Commission has been glad to lend support to these organizations and to receive suggestions from them. A plan is being evolved to center all of these protective associations in a central organization to be known as the California Conservation League, in an attempt to crystallize sentiment and avoid duplication of effort.



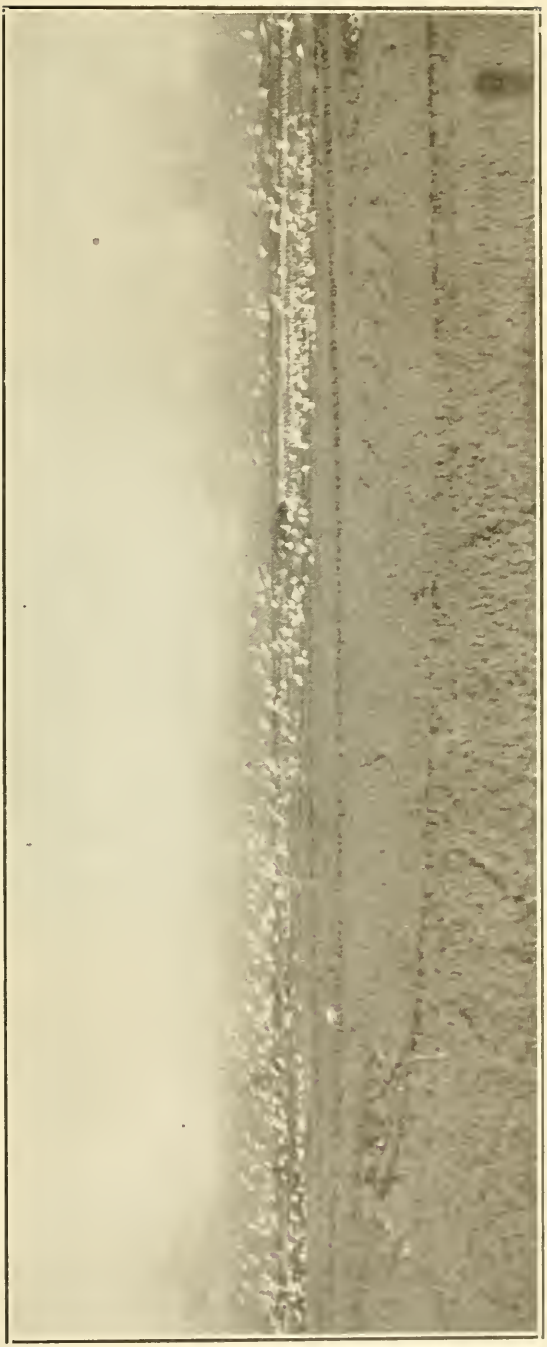


FIG. 5. Whistling swans in rice fields near Richvale, Butte, County, California. January 19, 1924. Photographs by George Thompson.

GAME CONDITIONS.

At the last legislature the bill providing for a deer license and a one buck limit which was proposed as a means of giving better protection for deer failed of passage by reason of the belief that the money would revert to the general treasury instead of to the fish and game preservation fund. This legislation must eventually come if we give the one large species of game mammal left in the state, in sufficient numbers for hunting, proper protection. The mule deer of the lava beds in Modoc County particularly need protection as the toll now being taken is altogether too large.

An unusual problem presented itself during the winter of 1923 when large numbers of deer met death by falling into a cement power ditch on the American River near Placerville. Immediate action was taken with the result that more than 500 deer were safely rescued from the ditch and bridges allowed the safe crossing of more than 2800 others—all on a front of seven miles. The Western States Gas and Electric Company, owners of the ditch, cooperated in rescuing the deer and a fence which has been installed will prevent a similar occurrence another year.

FIG. 6. Lower Klamath Lake as it appeared in the spring of 1924, once a federal bird reservation and California's most extensive waterfowl breeding ground. Due to unwise drainage it is now but an alkali waste. Photograph by Blanche Shaw.

The closing of the season on tree squirrels by the 1923 legislature proved a benefit to a species greatly reduced in numbers by a serious epidemic of disease. A continuation of the closed season beyond the September, 1925, date would doubtless be advantageous.

Wildfowl conditions continue favorable. If breeding and feeding grounds can be maintained by developing an unfavorable sentiment toward the endless drainage projects the future looks bright.

FISH CONDITIONS.

The spring and summer of 1924 proved so dry that there was a consequent destruction of fish. Many streams that normally have plenty of water to support fish life dried up entirely, with resulting destruction of all fish life in them. Deputy fish and game commis-

sioners, forest officers and park rangers aided materially by transplanting fish from isolated pools to permanent streams. It will doubtless take several years to recoup from the depletion due to the past season.

Low water in the streams in many instances made fishways ineffective. With water several feet below the crest of a dam no water enters the fishway and migratory fishes are prevented from reaching their spawning ground. Too often thought of the conservation of fish life is obscured by the demand for electric energy. A whole stream is sometimes diverted from its course or the entire flow utilized in a power plant, leaving a dry stream bed and complete destruction of the fish life, a natural resource impossible to replace.

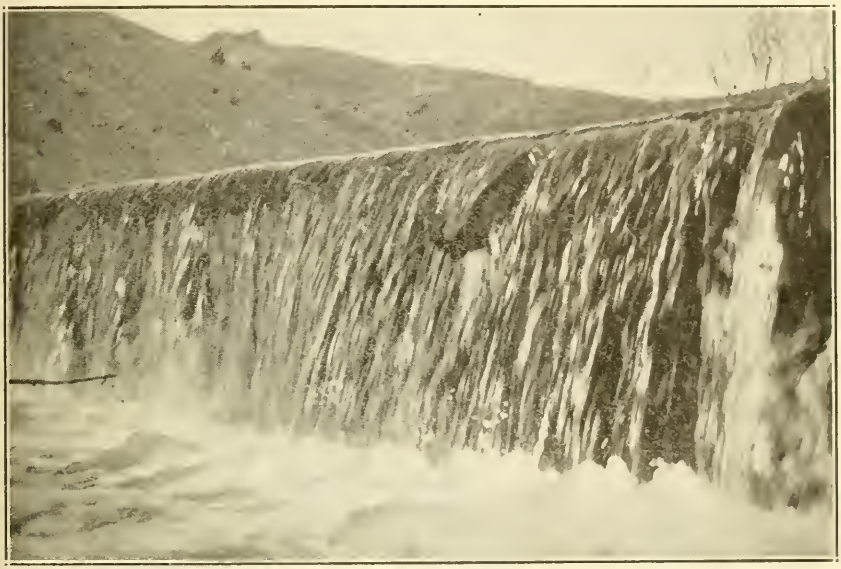


FIG. 7. One version of "Over the top." Steelhead trout jumping a waterfall in Trinity County. Photograph by C. O. Fisher.

Heretofore, power development has taken place high in the mountains with no serious loss of breeding grounds to migratory fish. The proposed building of a 250-foot dam near the mouth of the Klamath River with the consequent issuance of preliminary federal and state permits presented a very fundamental conservation problem. Since salmon have not been known to successfully negotiate more than a 40-foot fishway, it hardly seems probable that any method can be devised for carrying them over a 250-foot dam. It appears certain that the construction of such a dam would mean the ultimate destruction of the last unspoiled run of king salmon and steelhead trout left in the state. Furthermore, the proposed development on the Lower Klamath would mean the destruction of the best source of egg supply for the state's fish hatcheries. Almost the entire supply of salmon eggs is secured at Klamathon, and the best supply of trout eggs is secured at the four or five egg-collecting stations along this river. Practically every stream in the state, and most of the lakes, have been stocked with eggs secured from the Klamath River trout.

The Fish and Game Commission felt that it would be derelict of its duty if it did not champion the saving of the fish in the Klamath. It consistently fought the applications for permits and failing in this decided that the saving of the fish could be accomplished only by submitting the matter to the people through an initiative. Consequently, in the spring of 1924 the Commission aided in securing an initiative petition which finally went to the Secretary of State with the largest number of names ever turned in on a similar petition. As a result, the matter was referred to the people for a vote. The measure provided for a fish reserve which would be open to the angler and available for a source of eggs for the state's hatcheries, but be closed to the building of dams or other obstructions that would hinder the migration of fish. The saving of the fishery resources of the Klamath are largely dependent on a favorable vote on this measure.

PROBLEMS.

The main problems of the Fish and Game Commission are still to be summed up in three words: "pollution, drainage, and power dams."

In spite of useful laws and better public sentiment, the pollution of inland and coastal waters with oil still continues. It is hoped that the aid of federal legislation will help to improve conditions.

FIG. 8. One year's accumulation of illegal nets in the Sacramento District being destroyed by fire, March, 1924. Law provides for this mode of disposal of those nets having illegal mesh. Photograph by George Neale.

No better example of the danger attendant upon unwise drainage has been afforded than that of Lower Klamath Lake in the northeastern corner of the state. This lake was in a federal bird reservation and here thousands of shore birds and waterfowl reared their young each year. The area was drained at an expense of $300,000 and now it is discovered that the lake bed is wholly unfit for agriculture and residents and conservationists alike are pleading for a reflooding of the lake. It was only through decisive action that the

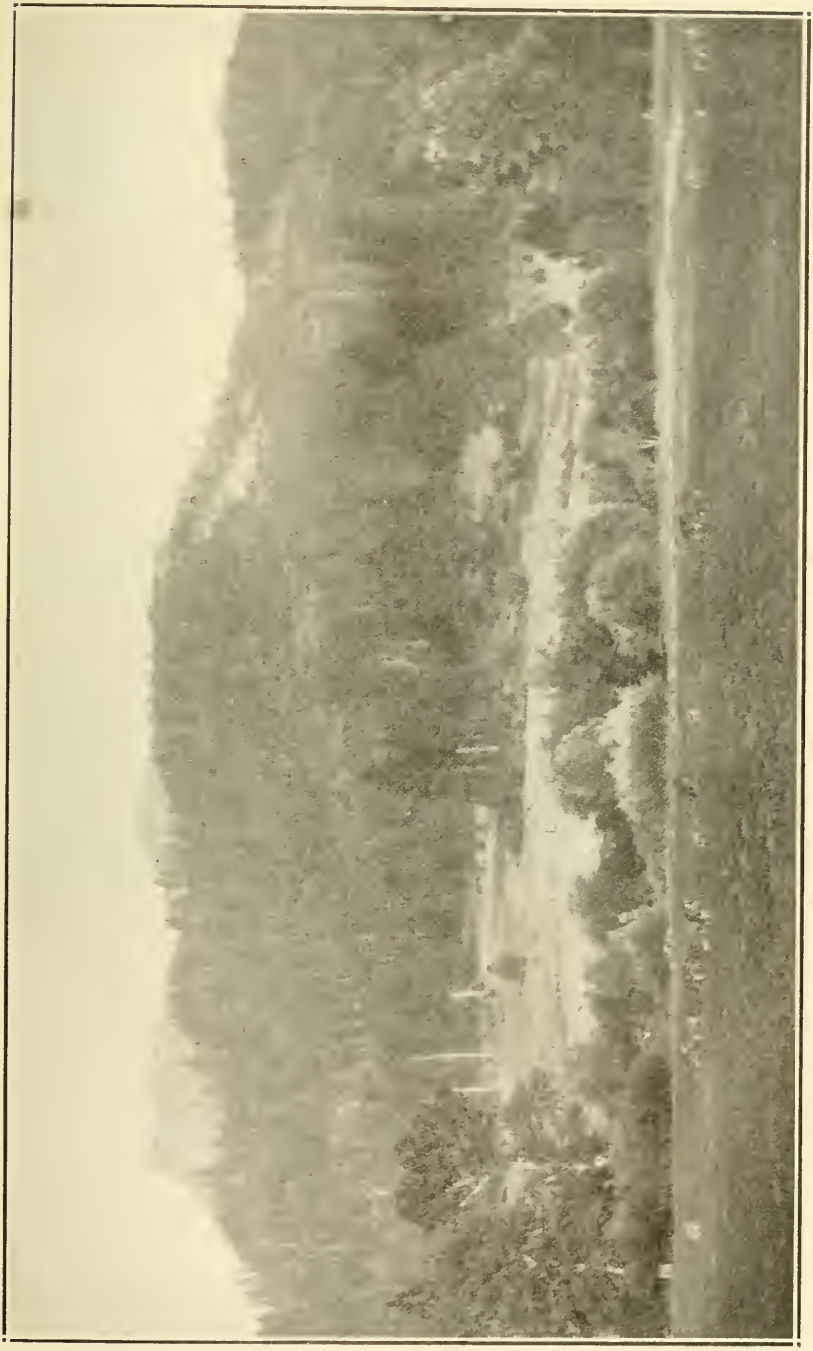


Fig. 9. Evening sees the wild deer come in to feed. Photograph taken near Gazelle, Siskiyou County, 1924, by William Lippincott.

draining of Lake Earl in Del Norte County was prevented. In many instances, lowered water tables nullify the expected valuable results of drainage. Marsh lands have real values and these values should be recognized before it is too late.

The diversion of water from rivers where trout have existed for ages into ditches for power and irrigation purposes have in many cases rendered streams almost barren of fish life. Also the draining of a number of lakes and storage reservoirs by the power and irrigation companies have caused the death of many thousands of trout and bass which it will take the Commission many years to restore. The extreme drouth has been the cause of the drying up of many streams and the consequent death of many fish.

The generosity of the Division of Water Rights in allocating the water of the streams and lakes without the least consideration of the needs of fish life and the overgrazing privileges given in the forests without due consideration of the needs of the wild life of the state are situations difficult to handle. Until such time as due consideration is given to the needs of wild life and less, perhaps, to the almighty dollar, California's wild life will continue to suffer. Legislation should be enacted that would conserve both feed for the deer and other wild mammals of the forest, and sufficient water in the streams and lakes to sustain fish life. Of what use are wardens to protect game that is starving or hatcheries to propagate fish which ultimately meet death because of a lack of water sufficient for their existence?

ACKNOWLEDGMENT.

During the war, the free transportation which had been furnished the Fishcultural Department for the distribution of fish was rescinded, causing a large additional item of expense. The railroads of the state have again generously granted the Hatchery Department transportation for employees and fish. The money thus saved the Commission in planting fish has been made available for the expense incident to a larger output in the state hatcheries. Grateful acknowledgment of the splendid assistance thus afforded by the various railroads of the state is hereby made.

REPORT OF DEPARTMENT OF FISH CULTURE.

The Honorable Board of Fish and Game Commissioners,
State of California.

SIRS: In conformity to the regulations of the Fish and Game Commission, I herewith transmit the report of the Department of Fish Culture for the biennium ending June 30, 1924.

During the seasons covered by this report, we have exceeded the output at our hatcheries over any similar period of fishcultural operations in this state by several millions of trout fry, having hatched and distributed during the seasons of 1922 and 1923, 56,527,105 trout fry besides 35,495,550 salmon fry. This record plus the trout fry on hand that are being distributed this season, will make the largest output of fry and the three greatest years in the history of the Commission's operations.

There were hatched and distributed during 1922 and 1923, 35,495,550 salmon fry. These were all collected at Klamathon egg-collecting station on the Klamath River in Siskiyou County. This take would have been exceeded by ten millions of eggs if our racks had not been flooded by the California-Oregon Power Company at the height of the season, during the month of October, 1923. A more detailed account of this will be given further on in our report.

During the biennial period just past, the same number of egg-collecting stations and hatcheries have been operated as mentioned in our last report. We have practically operated during this time thirty hatcheries and egg-collecting stations. Two of our stations are still operated under tents as the funds have not been available for the construction of permanent hatcheries. Had the funds been set aside from the amount available for fishcultural operations, the output of our hatcheries would have been greatly increased.

As in former years, two fish distributing cars have been used in distributing fry from Mount Shasta Hatchery, as well as from Mount Whitney Hatchery, to the different portions of the state that were not supplied from local hatcheries.

As stated in our last report, we can not emphasize the necessity stronger than to repeat that the streams are fished so hard that very few, if any, adult fish are left for breeders and consequently, the great majority of the fish that are found in them are the result of hatchery production. There is a demand for more hatcheries and a larger output of fry, but funds must be provided before any further

increase of fish from our hatcheries can be had or new hatcheries constructed. Several more hatcheries are needed in the state, not only to supply an ever-increasing demand for trout fry, but to save carrying the fish so far as they are now, paticularly to the more remote parts of the state where the lakes and streams are situated far from the railroad. We are constantly giving instructions to persons applying for fish to make a wide distribution of the fry. The best results are obtained where the fry are well scattered and planted on the ripples and in the shallow water of the lakes some distance from shore.

The large output of our hatcheries did not more than half meet the demands of the applicants throughout the state as the demand for trout fry for stocking the rivers, lakes and streams of California is increasing annually. And with the increasing population of the state, and the popularity of California as a recreation center, the fishing in the mountainous sections where the majority of the people enjoy their vacations is so excessive that measures to increase the number of fry to be distributed each season must be arranged and a shorter open season established to allow the fish to attain a larger growth. Plans must be made for the construction and equipment of more hatcheries, building of pond-rearing systems and the improvement of the egg-collecting stations. The possibility of increasing the output of eggs from the Klamath River by the introduction of a larger number of rainbow and steelhead trout fry, as well as salmon fry, must be stressed so that this river may furnish eggs for the other hatcheries in California, where rainbow, steelhead and salmon are in great demand and where suitable waters are to be found for these species.

The number of hatcheries in the state should be increased as the demand for trout fry exceeds the limit of the present hatcheries. Lakes need to be set aside for the purpose of propagating brood stock from which the eggs can be collected, as well as pond-rearing systems where spawning fish can be reared for egg-collecting purposes. We have but the one egg-collecting pond system at Mount Shasta Hatchery and, to meet the demand of the angling public, the Commission should build one or two more systems equal in capacity to that at the Mount Shasta station. Mount Shasta Hatchery can not be enlarged as the water supply and land is limited to the present capacity of the station. Surveys should be made at an early date to find other suitable sites for pond-rearing systems for there is no method by which eggs can be more easily procured for propagating the exotic species of fishes than in pond-rearing systems.

The State Fish and Game Commission is making an effort to procure more funds to establish pond systems where exotic species of fish can be raised in numbers great enough to furnish at least two-thirds of the supply of eggs for the different hatcheries located throughout the state.

We have one of the best pond systems to be found anywhere at Mount Shasta station; but as stated in a previous report, it is not large enough to meet the growing demand for trout eggs. Approximately 30 per cent of the trout fry collected in California this season were taken from the pond system at Sisson at the average cost per thousand less than the cost of collecting wild eggs when the expense of constructing traps and other paraphernalia necessary in handling the spawners and the work of collecting eggs from wild fish is considered.

Outside of the Klamath River, Lake Tahoe, Bear Lake in San Bernardino County, and Plumas County stations, eggs can be procured from properly equipped ponds for less money than they can be from wild fish when the uncertainty of collecting eggs from wild fish is considered. The droughts, floods, deep snow and extremely cold weather conditions always make the egg-collecting work uncertain. We do not know from one season to another what to expect. During seasons of extremely light rain and snowfall, conditions prevail that are unfavorable for the collection of trout eggs. Other years floods and extremely high and cold water change the movements of the fish and the take of eggs is often far less than we expect. Breaking up of runs of trout in our streams by high dams built by hydro-electric companies and irrigation projects are all having their effect and, to meet these new conditions, the legislature should provide ample funds for the construction of rearing ponds where a sufficient number of breeding fish can be raised to supply the demand for at least two-thirds of the waters to be stocked.

Salmon, rainbow trout, and steelhead trout can be saved to the people for many years to come by the proper development of the Klamath River and the saving of this stream as a fish refuge. If this stream is lost to the public as an egg-collecting stream by the construction of high dams in the lower reaches of the river, it will mean a great loss to the general public. The expense of maintaining pond systems is costly and locations are hard to find where perfect conditions can be found for the rearing of a sufficient number of brood fish, particularly of the rainbow and steelhead species. The development of hydro-electric energy by the erection of high dams in the tributary streams of the Sacramento and San Joaquin rivers has materially reduced the number of salmon in the Sacramento and San Joaquin rivers and Monterey Bay regions. Practically all the salmon now to be found in the Sacramento and San Joaquin river basins and Monterey Bay region are the product of hatcheries at Battle Creek, Mill Creek and Klamath River stations. The number of salmon fry produced in the Klamath River stations has assisted greatly in keeping up the supply in the Sacramento River.

The larger portion of the salmon in the Klamath River are the Sacramento race of king salmon that were introduced into the Klamath River by the Fish and Game Commission in its salmon cultural operations during the years past. The native Klamath River salmon do not appear in any great numbers in the river in the last few years. Our fishcultural experts at the Klamathon station support the view that the large majority of the fish taken from the Klamath River at the Klamathon egg-collecting station are of the Sacramento race.

If the Klamath River is set aside as a fish refuge, by increasing the number of fry planted in this stream, a larger number of rainbow and steelhead eggs will be collected; and, as it is the only river of any consequence left in this state in which there is a run of king salmon to handle for artificial propagation, it is of great importance that this stream be saved as a fish refuge so that the state at all times may have, not only an adequate supply of salmon eggs to keep up the supply of salmon in the Sacramento River and Monterey Bay regions, but also furnish a large percentage of our rainbow and steelhead trout eggs

for distribution throughout the entire State of California. The construction of the proposed high dams in the lower reaches of the Klamath River will break up the run of these anadromous fishes so that the egg-collecting work on this river will soon be a thing of the past.

During the last two seasons, the experimental work on the South Fork of Eel River near Branscomb, where several traps were located and temporary egg-collecting stations established in an effort to collect a large number of steelhead trout eggs and sufficient number of salmon eggs to stock Eel River, has proved futile as the uncertainty of the flow of water in Eel River, caused by extremely low water in periods when the fish should be running, or great floods, has proved that the upper reaches of the South Fork of Eel River where our experiments have been carried on is not a suitable place to attempt to collect eggs of either salmon or steelhead trout. The lower reaches of Eel River are subject to such extreme conditions of water from the minimum to the maximum flow that it is not dependable. The lower reaches of the South Fork of Eel River, near Garberville, or in the vicinity of Lane's Redwood Park, probably would be a suitable site for the collection of steelhead trout eggs; but, until practical experiments have been made in attempting to collect these eggs, no positive statement can be made whether this work can be carried on successfully in Eel River or any of its tributaries, except the Cape Horn dam on the South Eel River, which is now badly affected by the water being held back by the Gravelly Valley Dam during the season of drought, thus preventing the fish from ascending this fork of the river to the egg-collecting station located on Cape Horn dam. During the season just past, the dam did

FIG. 10. A Klamath River king salmon. Photograph by H. C. Bryant.

not fill so as to spill over and, consequently, no fish reached the egg-collecting station this year, thus depriving us of several millions of steelhead eggs. A lease was obtained on Gravelly Valley dam from the Snow Mountain Water and Power Company, the owners of this project, with the intention, if conditions proved suitable, of having this lake set aside as a preserve from which a large number of rainbow might be raised for the purpose of collecting their eggs to stock the streams of the immediate vicinity as well as have a supply to be shipped out to other stations. But protests from the citizens of Lake County, and the refusal of the Forestry Service to grant the Commission a lease on the lands bordering on Lake Pillsbury or Gravelly Valley dam, have prevented this department from carrying out its plans. The citizens of Lake County protested on the grounds that the dam was of greater benefit to them as a fishing resort to the public than for an egg-collecting preserve for the Fish and Game Commission. As they are drawing off the water each season for power purposes and the water in this lake fluctuates to such a great extent, it is somewhat doubtful whether the lake would furnish anywhere near the number of eggs that we formerly collected in the river immediately below the dam before its construction; that is, the Snow Mountain egg-collecting station located at the lower dam owned by this company.

If these protests against our experimenting on this lake are removed, several years will have to elapse before it can be determined how many eggs the brood fish in this lake would produce. The number of eggs that may be collected from fish raised in dams that have fluctuating heads, is always uncertain; and it becomes more apparent, as we look over the great State of California for suitable places where spawn-fish may be obtained, that the Klamath River, the last stream in California that has not been seriously affected by the construction of high dams, should be left to furnish a sufficient number of eggs of rainbow and steelhead to supply the needs of the state in other waters, as well as to provide king salmon eggs to maintain a greater portion of the run in the Sacramento River and Monterey Bay regions; and that adequate pond systems should be constructed for the rearing of our introduced species of fish, such as Loch Leven, European brown trout and Eastern brook trout.

As the fight to prevent the construction of high dams in the Klamath River by the residents of Siskiyou County, sportsmen's organizations and our Commission, has not yet been decided, since the matter is pending before the Federal Power Commission and in the courts of the state, as well as being submitted by an initiative petition to the voters of the state so that they may express their opinion, we can not add anything more to the argument submitted in our last biennial report, but will publish excerpts from the same report so that the matter may be brought before the minds of the people of the value of the Klamath River as a fish refuge.

We reiterate that the great Klamath River should be kept free from dams so that a stock of trout and salmon can be depended upon from that source for many years to come. The Klamath River runs through a mountainous region from the Oregon line, where it enters California, to its mouth on the boundary line of Del Norte County and Humboldt County, where it flows into the ocean.

There is practically no tillable land where the waters of this stream could be used for irrigation. All the small areas of tillable land along this river could be irrigated by tributary streams. Applications have been made to construct large dams on this river for the purpose of developing hydro-electric energy. As there is enough water appropriated in the other river systems of California to furnish electric power for the development of the state for many years to come without destroying the salmon and other anadromous fishes of the Klamath River by the construction of dams impassable by these fish, the construction of high dams in the Klamath River should not be permitted.

We feel positive, from our investigations and knowledge of the habits of the salmon, that the king salmon (*Oncorhynchus tchawytscha*) and the silver salmon (*O. kisutch*) will not ascend a fishway over a dam where the elevation is over thirty or thirty-five feet. Our experience in this state, and the experience of the experts of the Bureau of Fisheries and fishculturists in Oregon and Washington, confirm this statement.

There is a great protest being made by the people of Oregon and the Bureau of Fisheries against the construction of a dam ninety feet in height across Priest Rapids on the Columbia River, which confirms our opinion stronger than ever, that where the people have a stream of such value as the Columbia or Klamath rivers, no high dams should ever be allowed to be constructed if the fishing interests are to be considered. The people are entitled to at least one stream in each state from which they can collect an adequate supply of both salmon and trout eggs to supply the depleted waters of other regions.

The statement made that the Fish and Game Commission is retarding the industrial growth and development of the state by opposing these high dams is, in our judgment, not a fact, as there is sufficient energy being developed in other streams of California, where it is possible to construct power plants, to furnish the entire northwestern part of the state without embarrassing the development of that region or any other portion of California.

FISH PROPAGATION.

Applicants, without exception, are reporting fine results from previous plantings of fry and are continuing making applications from year to year, thus keeping the streams as well stocked as the conditions will permit where the fishing is so excessive as it has been for the last few years. The zeal and enthusiasm shown by the applicants who, year after year make applications to stock their favorite streams and lakes, is evidence of the intense interest in the fishcultural work in this state. The growing interest in the propagation and planting of trout fry is the result of good returns that we are producing by the cooperation of the persons planting fish for the Fish and Game Commission.

The distribution of trout fry by the sportsmen's clubs, boards of supervisors, and other interested parties, continues with the same enthusiasm as in former years. The public spirited citizens in the different communities have devoted their energy and furnished their labor in seeing that the trout fry are properly distributed. Each season we find better results of this cooperation as the persons interested in trout planting become more familiar with the proper distribution of the fry.

Some sportsmen's clubs, assisted by the supervisors of the counties, have established resting pools at the end of the auto roads where the fry are deposited and given a few days' rest before being carried by pack animal to the more inaccessible lakes and streams in the higher altitudes. The Fresno County Sportsman's Club and the Madera Rod and Gun Club have built a number of these resting pools in the mountainous districts where they are making their distribution of fry and have obtained excellent results. This is very commendable work as it gives the fry a chance to recuperate before continuing the long journey to the lakes and streams that are not accessible by trucks or wagons and have to be reached by pack animals. These resting pools are of great benefit if the fry are not held in them too long. A great many persons have advocated the holding of trout fry until late in the fall in ponds and nurseries along the streams where they desire to have the fish distributed, believing that if the trout fry are held until they are a larger size than when received from the hatcheries, better results could be obtained. Our experience has led us to believe that this is not a fact; and when trout are confined in ponds or nurseries they generally become large, fat and domesticated, lose their wild instinct of natural preservation that they have when first taken from the hatchery and a greater number of them will be destroyed by natural enemies, if held until late in the fall or the following spring, than if liberated as soon as they are swimming up and in condition to plant directly from the hatchery.

There are probably some places where larger trout might be of benefit when planted than those taken from the hatchery, but these places are very remote and in general trout planting, our experience has demonstrated to us, the sooner the trout fry are planted, the better the results.

TROUT DISTRIBUTION.

The total distribution of trout fry from the different hatcheries in the state for the biennial period 1922–1924 was 56,527,105, consisting of the following species:

Rainbow	21,696,365
Loch Leven	10,876,350
Steelhead	13,011,300
Eastern Brook	5,106,550
Large Lake	2,119,950
Black Spotted	816,090
Brown Trout	2,564,550
Cutthroat	255,950
Mackinaw	80,000
Total	56,527,105

On the date this report is being written, July, 1924, we have approximately 28,000,000 trout fry that will be distributed as a result of this season's operations.

SALMON.

To maintain even a fair supply of chinook, or king, salmon in the Sacramento River, Klamath River and Monterey Bay regions, as well as Eel River and ocean areas fed by this stream, becomes a greater problem each year. With the cutting off of natural spawning grounds by high dams in the tributaries of the Sacramento River and the depletion of Eel River by the excessive fishing of a few years ago, the

supply of salmon eggs to a great extent must be supplied from the Klamath River. During the seasons of 1922 and 1923, owing to the low water and seasonal conditions, the Bureau of Fisheries at Battle Creek and Mill Creek did not have any surplus eggs to furnish any of the California Fish and Game Commission's stations.

During the fall of 1921 there were collected at Klamathon egg-collecting station on the Klamath River 19,178,000 eggs. These were hatched and the resulting fry distributed as follows:

Sent to Fort Seward, fall of 1921	2,000,000
Planted in the Sacramento River, 1922	7,311,000
Planted in Fall Creek, spring, 1922	2,331,000
	11,642,000
Planted in Klamath River, fall, 1922	5,000,000
Planted in Fall Creek, fall of 1922	1,000,000
	17,642,000

During the fall of 1922 there were collected at Klamathon egg-collecting station on the Klamath River 20,824,000 eggs. These were hatched and the resulting fry distributed as follows:

Sent to Fort Seward Hatchery	2,250,000
Planted in Sacramento River	12,089,000
Planted in Del Norte County	40,000
Planted in Fall Creek	3,550,000
	17,929,000

The season of 1923 opened very propitiously for the collection of chinook salmon on the Klamath River. The opinion of our superintendent, Mr. G. H. Lambson, and his assistants, was that an equal number of eggs would have been taken, if not a greater number, than during the season of 1922, but, during the fore part of October when the pools were full of salmon between the racks and ready to be spawned and their eggs ready to be collected for our hatcheries, the California-Oregon Power Company opened their sluice gates on the big Copco Dam without giving our employees any warning of the danger that threatened our racks at Klamathon, and caused a great flood of water to descend the river which overflowed the racks and choked them up with debris, logs, brush and other detritus so that the spawning salmon escaped up the river, and, as the tributary streams between the racks and the Copco Dam were too low for any considerable number of these salmon to spawn, a great number of the eggs carried by these spawners was lost in the river between Klamathon racks and the Copco Dam.

The Company's attention was called to this damage and they agreed not to open their flood gates again without giving the Commission due notice, and at no time to open them to such an extent as to cause damage to our egg-collecting station. This damage to the season's work is to be regretted as every salmon egg that can be collected and hatched is necessary to maintain even a fair supply of salmon in our rivers and ocean area.

During the fall of 1923, 4,041,000 salmon eggs were collected, 250,000 of which were sent to Fort Seward Hatchery for distribution in Eel River. The remainder will be held in the ponds and planted this fall, the statistical report for which will not appear until the next biennial report of the Commission.

For years we have called the attention of the public and the legislature to the rapidly decreasing salmon supply in California with recommendations given in former reports, but, to date, no particular effort has been made to save this valuable fish from being greatly depleted, if not practically exterminated.

In a last effort to save this valuable fish to the people, the Fish and Game Commission, assisted by the people of Siskiyou County, and other districts, initiated a petition to submit to the voters on the November, 1924, ballot the decision whether we are to lose the Klamath River, the last stream that is not affected by high dams, and from which salmon eggs can be collected in any considerable numbers. The upper reaches of Eel River have been cut off by high dams and the uncertainty of the flow of water in Eel River caused by the great extreme between the maximum and minimum flow of the river makes Eel River one that cannot be depended on as a salmon egg-collecting stream; therefore, our efforts must be confined to saving the Klamath River as an egg-collecting stream for king salmon as we do not desire to see this valuable food fish practically exterminated in this state in the next few years.

We refer again to the closing sentence in our report on king salmon in the biennial report of 1920–1922: "The Fish and Game Commission is waging an uphill fight when it comes to conservation as the people do not realize the destruction of wild life until it is too late." Recommendations to conserve our fish and to increase the output of our hatcheries by practical and scientific methods go unheeded.

We can do nothing but reiterate the above sentence as practically the same condition prevails today as two years ago regarding the practical measures to save the fish in the Klamath River, with the exception that the measure will come before the people for their consideration. If they do not desire to see this valuable food fish practically exterminated, they will have a chance to prove it at the November election.

MOUNT SHASTA HATCHERY.

The high standard of work at Mount Shasta Hatchery has been maintained during the season of 1922 and 1923 the same as it has since the establishment of this station. Mount Shasta Hatchery has been operated to its full capacity during this period and 24,440,000 salmon fry and 27,994,450 trout fry were hatched and distributed from this station. This is one of the best equipped stations in the country, but it has practically reached its capacity for pond culture and for increased hatchery operations as we have not sufficient water or land to increase the capacity of this station. Therefore, pond systems must be established, as previously mentioned in this report, to enable us to collect a larger number of trout eggs to supply the other hatcheries now in existence and those that are to be established.

There were collected from the ponds at Mount Shasta Hatchery during the season of 1922–1923, 18,428,000 trout eggs. This number, with the additional eggs from outside stations, gave us a grand total of 27,994,450 fry to be distributed throughout the state.

The more important improvements made at this station since June 30, 1922, are as follows:

A concrete settling tank, which is also used for the diversion of water to the different hatcheries, was constructed, the dimensions of which

are 36 feet long, 8 feet 10 inches wide, and 5 feet deep, with walls 8 inches in thickness, and concrete foundation.

A new flume, 250 feet long and 14 inches by 16 inches, was built from the main supply ditch to hatcheries C and D. A number of the ponds were relined with new plank and inlets and outlets to six of the ponds were renewed. The ditch was enlarged west of the hatchery ground to make an additional fry pond. New screens were installed in all the hatchery troughs during the period covered by this report. Drain pipes were placed under the roads in front of Hatchery A. A new drain from Hatchery A to Pond No. 8 was installed. A new room was built in the attic of the foreman's dwelling and other improvements to keep the station in repair, but just enough repair work was done to prevent damage to the system of ponds and hatcheries so that they could be operated.

A number of improvements recommended to be constructed during the coming biennial period are as follows:

A new food preparation room, refrigerating plant and cold storage rooms for keeping the fish food in good condition. A new building should be constructed to be used as a storage room for fish cans and a paint room. This should have a steam boiler installed for steaming the cans, keeping them sanitary, something essential to keep the fish in good condition.

One new corrugated drain pipe to take water from Hatchery A. One galvanized drain to cross the road under the lane in front of Hatchery A, as the present culvert is in bad condition.

All the ponds, except two, should be relined with planking, in whole or in part. The planking on these old ponds and walls should be renewed, as they have been in use from 15 to 25 years. The superintendent's and foreman's cottages should be repaired; a concrete bridge constructed over the inlet of pond system on the road leading across the hatchery ground to barns and garage. These are only a few of the many improvements that are necessary to keep this important station in repair.

An additional water supply should be furnished to this station if it is to be operated to its fullest capacity, as the drought has affected it several times in the past; also, the water owners are using water from Spring Creek, from which this station receives its water supply, and take their usual amount regardless of the seasonal conditions, and the hatchery suffers accordingly. When the irrigation period was on this spring, the farmers diverted so much water that there were times when the fish in the hatchery, as well as in the ponds, were in danger of suffering materially, if not perishing, for want of sufficient water supply. A meeting was called at Sisson on May 20, 1924, and the water users diverting water above Mount Shasta Hatchery agreed to turn back from their ditches sufficient water to maintain the hatchery until seasonal conditions would bring about a larger flow in Spring Creek. This we greatly appreciated, as it prevented serious loss and damage to the fish at Mount Shasta Hatchery.

The auxiliary stations under the supervision of Mount Shasta Hatchery were operated during the last biennial period to their fullest capacity. These stations are Fall Creek Hatchery, Klamathon egg-collecting station, Hornbrook egg-collecting station, Bogus Creek egg-collecting station, and Camp Creek egg-collecting station.

KLAMATHON EGG-COLLECTING STATION.

There have been no improvements made at this station during the last two years other than the necessary repairs to keep the racks, traps, and station generally in condition for the catching of salmon and the taking of their eggs. There will be no improvements required at this station for the next two years. There were collected at this station 26,586,000 chinook salmon eggs, as follows: In the fall of 1922, 20,824,000; in the fall of 1923, 5,762,000. This take would have been at least ten million greater if it had not been for the disastrous flood that came down the river caused by the opening of the gates of the big Copco Dam.

FALL CREEK HATCHERY.

This station continues to be successfully operated. Since our last biennial report no improvements worthy of mention have been made; but recommendations for improvements are necessary at this time, as the hatchery troughs that were installed in this hatchery in 1918, at the time of its construction by the California-Oregon Power Company, were of poor material, being mostly soft pine which has decayed and become spongy to such an extent that we do not consider them any longer safe for the rearing of fish. We recommend the placing of an entirely new set of troughs in the Fall Creek Hatchery, made of a well-seasoned redwood; a new flume from the settling tank to the hatchery; a new floor in the hatchery, as the old floor has become badly rotted, owing to the leakage of these poorly constructed troughs; and the painting of the interior of the building. As the interior of this building has never been painted, the ceilings and walls are deteriorating very rapidly. The construction of another salmon-rearing pond is also recommended at this station so that a greater number of salmon fry can be held until the proper time for distribution.

HORNBROOK EGG-COLLECTING STATION.

There have been no improvements since 1922 at this station and there will be none for the next two years. The take of eggs at this station was below the average, owing to the prevailing drought for the last two years. The total number of eggs taken were 3,733,000.

BOGUS CREEK EGG-COLLECTING STATION.

This station was well repaired two years ago and no improvements will be necessary for the next two years except the extension of a concrete apron under the racks. The take of eggs at this station was approximately the same as normal for the last two years, as the drought did not affect these streams as greatly as it did Hornbrook Station. The take of eggs for the last two years was: In 1922, 4,336,000; and in 1923, 2,495,000.

CAMP CREEK EGG-COLLECTING STATION.

This station has not required any improvements for the last two years and none will be needed for several years. This station continues to furnish a large supply of rainbow trout eggs and will be one of our best stations until the seasonal rainfall is normal. The total take of eggs for the last two years was: In 1922, 2,356,000; and in 1923, 2,102,000.

MOUNT WHITNEY HATCHERY.

Mount Whitney Hatchery has been operated to its full capacity during the last biennial period, and we would respectfully recommend that a new hatchery of equal capacity be established on the Mount Whitney grounds, or a new station established in the Mono-Alpine region, so that a greater number of trout fry could be produced in this section of the state. There are also several possible sites on other streams in the Owens River Valley, but the Los Angeles aqueduct has taken over the greater portion of these, so it is doubtful if sufficient water could be obtained for the installation of another hatchery in this section. The increasing demands for fish in southern California and the region consisting of Inyo, Mono and Alpine counties, must be supplied from a source where eggs can be hatched and the fry distributed within the shortest distance for transportation. In all probability, we will be able to recommend to the board within the next year the selection of a site in either Mono or Alpine counties where a hatchery could be established that would relieve the heavy demand on the Mount Whitney Hatchery, thus allowing the output of this hatchery to be shipped to southern California.

During the spring of 1923, meetings were held in Independence with the other users of the water from Oak Creek, from which is obtained our supply of water for Mount Whitney Hatchery, and an amicable adjustment was made of the amount of water to be used at this station for the propagation and rearing of fish, as well as the amount to be used on the lawns and flower beds. Mr. Gordon Zander, of the Division of Water Rights, kindly assisted in bringing about this adjustment. The amount of water for the use of the hatchery grounds, lawns, and flower beds, was measured and the amount determined that the state should use for this purpose, which was agreeable to the other users of water from Oak Creek.

COTTONWOOD LAKES STATION.

This station was last operated in 1920. Owing to the large take of eggs which filled our hatcheries to their capacity during 1921, 1922 and 1923, the Cottonwood Lakes Station was not operated. In the spring of 1924, at the request of a number of prominent sportsmen in southern California, we planned to open this station for the collection of golden trout eggs for distribution in barren lakes, and, also, in some of the lakes in which golden trout had been introduced several years ago in the Mono-Alpine region, and in which they are now thriving wonderfully well. Upon the arrival of our crews at this station at the time the golden trout are usually entering the tributary streams of these lakes to spawn, our men found these streams practically dry owing to the extreme drought which has prevailed over the entire coast. The traps were installed in the creek flowing between the upper and lower lakes and 460,000 golden trout eggs were collected. These were hatched and will be distributed in the lakes suitable for this species of fish this coming fall.

RAE LAKES STATION.

The Rae Lakes egg-collecting station was not operated during the spring of 1922; but, owing to the shortage of eggs at other stations, was operated again during the spring of 1924 and the 410,000 eggs collected were transferred to the Mount Whitney Hatchery and the resulting fry will be distributed from that station.

TAHOE HATCHERY.

The new Tahoe Hatchery building was completed during the fall of 1920; but since then we have not been able to construct the foreman's cottage, food preparation room and other outbuildings, or improve the grounds as they should be to be in keeping with this fine station. This we hope to be able to do within the next year. The water system furnishing the water supply to this hatchery should be remodeled and open flumes constructed from the springs to the settling tanks, as well as ponds for a considerable area around the springs from which this water supply has its source, in order that the water will be more fully aerated and given a chance to reach a higher temperature. The water in these springs is very cold and conducting it through pipes does not give the sun's rays a chance to warm the water to the proper temperature for rapid development of trout fry. The water is very pure and cold and the fry do remarkably well, but their growth is retarded by the low temperature of the water. We deem it advisable to have open flumes with ripples so arranged that the water will receive a higher degree of aeration than is possible in passing it through the pipes, as well as giving it the benefit of the sun to raise the temperature.

There were produced from this hatchery during the last two years 2,935,000 trout fry, as follows: In 1922, 975,000 rainbow trout, 480,000 black spotted trout, 100,000 steelhead trout, and 145,000 large lake trout; and in 1923, 445,000 steelhead trout and 790,000 large lake trout.

MOUNT TALLAC HATCHERY.

This station has been operated during the last two seasons under the same conditions that have prevailed during former years. We are always compelled to plant the fry quite early owing to the rise in temperature of the water in Fallen Leaf Lake, from which this hatchery receives its supply. After the warm weather sets in the temperature rises and the water moulds and algal growths have a deleterious effect on the fish, which necessitates planting earlier than we otherwise would. However, the fish are planted in good condition and, as the water is warmer from the beginning of the season than it is at some of the other stations, the fish attain a good growth by the middle of July, so at that time they can be planted and good results expected. We would recommend the installation of a new floor in this hatchery, as well as an entire new set of troughs and distributing tanks and other fixtures incident to the hatchery equipment. The old equipment is now so badly decayed that it is not safe for any further use in the rearing of fish. This work should be done during this coming fall as soon as the trout fry are out of the building.

Traps were operated in Blackwood Creek, Ward Creek and Taylor Creek during the seasons of 1922 and 1923 and eggs collected as follows:

In 1922—Taylor Creek	205,000	
Blackwood Creek	215,000	
Ward Creek	180,000	
	600,000	
In 1923—Taylor Creek	515,000	
Blackwood Creek	590,000	
Ward Creek	640,000	
	1,745,000	

To insure the safety of these traps during seasons of heavy snow fall when the melting snow causes flood conditions, concrete toe walls should be constructed across the beds of these creeks, as well as concrete cribs placed in the streams to support the chords in the trap frame. This would insure us against any accidents which might be caused by flood waters in these creeks.

UPPER TRUCKEE RIVER EGG-COLLECTING STATION.

The same condition prevails at the Upper Truckee River egg-collecting station, and this station should be improved by a concrete abutment on the side of the creek, as well as cribs and concrete toe walls or aprons across the creek bed to prevent the traps from washing out when streams again are normal, thus insuring the safety of all of these traps. There were collected from this station 200,000 eggs during 1922.

UKIAH HATCHERY.

During the season of 1922 this hatchery was operated to its capacity, but no improvements were made until the winter of 1922–23 as it was necessary to procure a new lease on this property from the town of Ukiah. After procuring a lease for a period of five years from the trustees of the town of Ukiah, beginning January 21, 1924, we made repairs to this hatchery. This property was received from the Northwestern Pacific Railroad Company many years ago when the railroad company, in conjunction with the Fish and Game Commission, operated this hatchery for a number of years. Since the railroad company ceased to operate this hatchery it has been operated by the Fish and Game Commission under a lease from the town of Ukiah. No great amount of money was expended on the repairs—just enough to keep the station in good condition. A new pipe line was installed to furnish the water supply, as the amount of water at this station is limited and any leakage from the old flume caused considerable damage to the hatchery operations. During the spring of 1924, owing to the shortage of water, a limited number of eggs had to be placed in this station, and, as the drought prevailed through the sections that are usually planted from this hatchery, some fry were hatched to supply all of the streams in this section and an early distribution made. The following number of fry were hatched during the last two years: In 1922, 962,500; and in 1923, 1,015,000.

SNOW MOUNTAIN STATION.

At this station 1,594,000 eggs were collected in 1922 and 2,857,960 in 1923, and the resulting fry hatched in the Ukiah hatchery and other stations of the Commission. Owing to the shortage of water in the South Eel River during the season of 1924, the station was not operated. Preparations were made during the winter to operate this station the same as in former years, but the Gravelly Valley Dam held back the water in the South Eel River, thus preventing a sufficient flow of water to reach the Cape Horn Dam, at which place the Snow Mountain egg-collecting station is located. There was not sufficient water passing this dam at any time to enable the steelhead trout to ascend this branch of the Eel River so the eggs could be collected. The drought that prevailed throughout this region was probably greater

than in any other area of equal proportion in the state, considering the rainfall that usually prevails in this section. The main Eel River was very low all through the winter and spring and very few steelhead ascended as far as Dos Rios, and as this is at the junction of the South Eel and the middle fork of the Eel, the water in each branch was lower than the points below, so that very few fish entered either the South Eel or the Middle Eel and none reached the egg-collecting station as no water passed Cape Horn Dam during the period the fish were ascending the river.

FORT SEWARD HATCHERY.

This station has been successfully operated during the last two seasons. The fry produced have been fine, vigorous specimens of fish, showing good care and skillful handling of eggs and fry at this station, which is a difficult station to operate, owing to the uncertainty of the water during periods of drought. No great improvements have been made during the last two years, but we recommend that the following improvements be made this coming fall as soon as the trout fry are distributed: Sixty new standard troughs to be installed in place of the old shallow troughs that have been in use a great many years (the sixty old troughs were shipped from Price Creek Hatchery which was abandoned in 1916 and installed in the Fort Seward Hatchery after they had given service at Price Creek Hatchery for a period of fifteen or sixteen years). These troughs are now so decayed and spongy that they are no longer safe for the rearing of fish. New underpinning for the troughs; new distributing tank; waste flume; repairs for the old foundation of the hatchery; new settling tank; new head box in Powers Creek pipe line; and a new floor in the hatchery aisle are all repairs necessary to be made this coming fall before the salmon eggs are ready for shipment to this station. As this hatchery must supply the trout fry for the region covering northern Mendocino County, Humboldt County, and western Trinity County, it is very essential that this station be kept in the best possible condition so an adequate number of fry can be hatched to supply the ever growing demand for fish in this section. This hatchery, like all others in California, during the season of 1924 did not turn out as many fish as in former seasons, owing to the drought which prevailed. The total number of fry distributed from this station during the two seasons just past is as follows:

In 1922—	Salmon	1,997,430
	Rainbow trout	294,286
	Steelhead	425,033
	Black Spotted	146,090
	Large Lake	71,630
	Cutthroat	99,630
		1,036,750
In 1923—	Salmon	2,177,120
	Rainbow trout	667,550
	Steelhead	1,940,000
	Large Lake	98,260
	Cutthroat	156,260
		2,862,080

BROOKDALE HATCHERY.

All of the steelhead eggs collected at the Scott Creek Egg-Collecting Station were transferred as usual to this station during the last two years, and from there distributed to the other hatcheries and the usual number of fry hatched for Santa Cruz County. Owing to the increasing demand for water from Alba and Clear creeks, which supply the summer residents who have cottages at Brookdale, and the drought which has prevailed in this section, and other causes, we deem it advisable to buy an additional piece of land at Scott Creek station where the state already owns the ground where the egg-collecting station is located, and construct a new building to hatch the fry for the district comprising Santa Cruz, Monterey, Santa Clara and San Mateo counties. An ample supply of water can be obtained from Big Creek to operate a hatchery approximately twice the size of the Brookdale Hatchery, which is necessary to supply this section of the state. The fry can easily be distributed from this station to the railroad at Davenport, as well as by truck to the main line at Santa Cruz. The county board of supervisors of Santa Cruz County have rendered every assistance possible to make Brookdale Hatchery a success and are cooperating with us to secure a hatchery site on Big Creek for increasing the production of fry for that section of the state; and we hope by the time this report is published that we will have the site secured and be able to submit plans for the construction of a new hatchery on this proposed site. The hatchery at Brookdale is rapidly decaying, as the building is quite old and the troughs, tanks, and even the foundation would have to be rebuilt if the station is run longer than another season. We do not deem it advisable to construct a new station on the old site and recommend the construction of a new hatchery on Big Creek, a tributary of Scott Creek. The land held under lease at Brookdale could be held and the small ponds used for the rearing of trout fry when the surplus fry from the main station at Scott Creek would cause us to look for more room than the hatchery would furnish. The small ponds might be put to good use by the county in holding their fry until they were ready to make the distribution.

The total number of fry distributed from Brookdale during the seasons of 1922 and 1923 is as follows: In 1922, 859,000; and in 1923, 850,000.

SCOTT CREEK STATION.

This egg-collecting station has been holding its average up to the present time. The flow of water at this station has been interfered with by the appropriation of water from this stream by a Mr. Widemann, who filed an application with the Water Commission to divert a portion of the water from this stream for use on lands adjacent to Scott Creek. We protested the matter to the Division of Water Rights and are now awaiting an adjustment of the water supply which we desire to remain in this stream so that the fry will have ample water in which to maintain themselves during the summer months before descending to the ocean. This is very essential if Scott Creek is to be operated as an egg-collecting station and spawners, or adult fish, maintained in this stream. We are of the opinion that an amicable adjustment of the amount of water can be obtained and that there will not be any serious trouble with the pumping plants established by Mr. Widemann.

CLEAR CREEK HATCHERY.

The Clear Creek Hatchery and egg-collecting station has been successfully operated during the last two years. During the spring of 1922 we had the usual run of fish in Clear Creek, a tributary of the Hamilton branch of the Feather River, from which the fish come that furnish the eggs for this station. There was also a good run in 1923. There was a larger run of fish than usual in the Hamilton branch of the Feather River in the spring of 1924; but, owing to the low condition of the water in the Hamilton branch caused by the drought, and, also, by the diversion of the water by the Red River Lumber Company to their power plant, we had considerable difficulty in collecting eggs. However, 3,100,000 eggs were collected this spring (1924). During 1922, 1,683,000 eggs were collected and in 1923, 2,100,000 were collected, making a total for this station for the biennial period of 1922–23 of 3,783,000. A two-room cabin was built for the crew in the fall of 1923 and some additional troughs installed in the hatchery. Improvements were made to the traps and fish holding tanks. This hatchery should be enlarged as soon as funds are available as it is necessary to hatch a greater number of eggs to maintain the supply of fish in the streams and lakes of this region.

WARNER CREEK TRAP.

Owing to the exceedingly high water in Warner Creek, this station was not operated in the spring of 1923. During 1922 1,905,000 eggs were collected; and, owing to the low condition of the water in 1924, it was successfully operated and 2,892,000 eggs were collected. Improvements were made in the fall of 1923 at this station by repairing the traps and flume and adding sixteen feet to the fish holding tank. A small eyeing station of six or eight troughs should be installed at Warner Creek so as to hold the eggs until they are advanced far enough to ship to other stations. It is quite difficult in the early spring, when the snow is deep in this section, to transport the eggs from this station to Domingo Springs station where they are hatched. The mouth of the creek, where it has its confluence with Rice Creek, should be widened and a permanent crib installed so the racks can be moved to this point, a more suitable place than the place where they now are.

DOMINGO SPRINGS STATION.

This station has been in operation the last two years with its usual success. In the fall of 1923 a new flume was built to furnish the water supply for the hatchery and the fish-holding tank. As soon as funds are available, this station should also be enlarged so as to increase its capacity to at least double what it is at present as more fry are needed each year to supply the lakes and streams in all sections of the state wherever hatcheries are located. To properly handle the situation in this section, a permanent rack, or rolling dam, should be placed across the north fork of the river below the junction of Rice Creek and Warner Creek and a permanent station established. This would cost several thousand dollars, but the results that would be obtained would justify the expenditure as the work could all be concentrated at the one station and a great many more fish caught, and eggs procured that are now deposited on the spawning beds below Warner Creek and between the mouth of Warner Creek and Domingo Springs station.

These small traps and egg-collecting stations have been built because we did not have the funds to concentrate our work. The initial expense of installing the large stations was too great for the funds furnished our department. Whenever funds are available for this improvement work, the benefits to be derived from the establishment of permanent traps, larger stations, and better equipment, will result in a larger output of eggs for less cost per thousand after the initial expense of establishing the station has been made.

JOHNSVILLE EXPERIMENTAL HATCHERY.

The Johnsville Experimental Hatchery was operated for two seasons. Owing to the great depth of snow and the inconvenience of getting eggs to the station in early spring, it was deemed advisable to select a more favorable site. During the spring of 1922, when our men arrive on the ground to begin operations, the snow was from 12 to 15 feet deep on the level, with great masses on the slopes of the adjacent mountains, threatening to come down in the shape of an avalanche at any time. The work of shoveling out the snow and opening the station was an arduous one and fraught with great dangers. As soon as the distribution of the fry was over in the fall of 1922, arrangements were made to move the flume, tanks and other material to a new site located on the property of Mr. W. A. Adams, on Haskell Creek, a tributary of Sulphur Creek, near Clio, Plumas County, in a locality where the snow does not fall so deep, and several miles nearer the railroad than the site on Jamison Creek. In the spring of 1923, after procuring a lease from Mr. Adams for 25 years, a foundation was laid for the support of 40 hatchery troughs. The water at this new site was thoroughly tried out last season and during the spring of 1924. It proved to be of superior quality for the rearing of trout fry. We would recommend that a permanent hatchery building and station be established on this site, as it is the best site so far found anywhere in the immediate vicinity of the Western Pacific Railroad in the Feather River region. During the last two seasons 877,380 rainbow and 857,000 steelhead trout fry were distributed from this station in the lakes and streams of the Feather River district.

BEAR LAKE HATCHERY.

The Bear Lake Hatchery is situated in the San Bernadino Mountains, in San Bernardino County, at Green Spot Springs near the shores of Bear Lake, and, as usual, has been successfully operated during the last two seasons. During the season of 1922, 1,365,000 eggs were collected at the North Creek Egg-Collecting Station on Bear Lake and transferred to this station for hatching and distribution. It was also operated in the spring of 1923 with practically the same success as in the previous year and 1,100,000 eggs were collected. This spring (1924), owing to the light snow fall and the lowering of the lake by the water company, it was more difficult to procure the eggs than in former seasons; but there appear to be as many trout in the lake as at any time during the last five or six years. As mentioned in our report of 1920–22, black bass were thought to have been introduced in this lake, but we were somewhat in doubt at that time. The fact is now well established that thousands of this species of fish are in the waters of Bear Lake and are increasing annually as there is a great

abundance of food in the waters of Bear Lake—probably greater than in any other lake of equal area in the state—consisting of all native aquatic insects, as well as gammarus and minnows. There is an abundance of food to last for several years to come and the bass will not prey on the trout to any great extent until this supply of food is greatly reduced by the increasing numbers of bass. By holding our trout fry until late in the fall when the bass have left the shallows to return to deep water and become torpid, the trout fry can be released and will have a fair chance of maintaining themselves in goodly numbers for a great many years, or until such time as the bass have destroyed the abundant supply of insects and minnows and begin to devour their own young, as well as the trout. But until such time as this condition prevails, we shall continue the operation of Bear Lake Hatchery, as the trout fishing during the spring of 1924 was exceedingly good and promised to hold out during the entire season. As the period of the year during which bass will bite is very short, and as they do not furnish as good a game fish for the anglers as do the trout, and as there are so many lakes and streams in lower altitudes where the water is too warm and full of organic matter for trout to thrive, it is to be deplored that bass were ever introduced into this lake by thoughtless persons for reasons best known to themselves.

NORTH CREEK EGG-COLLECTING STATION.

This station is located on the shores of Bear Lake. During the last two years the bulk of the eggs furnished the Bear Lake Hatchery were collected at this station. The total number of eggs collected was 3,611,000. Of this number 1,150,000 were hatched and distributed from the troughs where they were hatched after the other eggs were eyed and shipped to the main hatchery at Green Spot Springs. Temporary repairs to the traps and tanks were made at this station in the spring of 1922, as they were damaged in the winter by the flood waters that came down North Creek. The repairs necessary to be made at this station to maintain it for several years longer are to repair the roof by replacing it with an iron roof; the general overhauling of the hatchery troughs; and improvements to the trap and tank system. This work should be done during this coming fall.

GROUT CREEK TRAP.

Grout Creek station was damaged in the spring of 1921, in fact, it was entirely washed out and carried down the stream. There has been no water in this creek since that time to justify the expenditure of any considerable sum of money to install a permanent trap; but, if there should be a heavy snowfall in the watershed of this creek, it may, in all probability, be well to install a permanent trap to catch the trout that ascend the stream during the spawning period. The stream rapidly subsides after the snow is through melting, and if the fish are not caught and the eggs collected, a great many of them, in fact, the largest percentage of them, perish on the sand flats at the mouth of this creek or are caught in the pools above the sand flats near the shores of the lake when the water recedes; therefore, it would justify the expense of installing a fairly good trap to catch these fish and collect their eggs and to prevent the loss of the breeders that are stranded when the water dries up in the stream.

METCALF CREEK TRAP.

This station is located on the shore of Bear Lake. During a season of normal rainfall this trap produces a fair number of eggs; but the take for the last two seasons was considerably less than in former years, owing to the small amount of water in the stream as well as to the blocking up of the mouth of the creek with sand bars. Considerable improvements can be made there to better the conditions at this small auxiliary station.

WAWONA HATCHERY.

Wawona Hatchery has been successfully operated during the last two seasons with the same good results as in former years. The total output of this hatchery during the biennial period of 1922–1924 was 389,300 steelhead and 498,200 rainbow trout fry. This station should be maintained as it is located on a site where it is easy to get the fry to the lakes and streams south and east of the Yosemite Valley. A cabin for the foreman should be built on the hatchery grounds this coming spring so that better protection could be given the plant during the time when the building is closed. Under the present arrangement, the foreman lives in a tent and the accommodations are not very good.

KAWEAH HATCHERY.

Kaweah Hatchery has been operated for the last five years under a tent and it is time that a permanent building be erected either on the present site or on a site in the Sequoia or General Grant National Parks. The improved roads, constructed since this hatchery site was first selected, cause us to believe that a more favorable site may be found in the Sequoia or General Grant National Parks; and a survey will be made in the near future to determine whether a better site may be selected. If the same can be found, recommendations will be made for the erection of a permanent hatchery in this section. If a new site can not be procured that affords better opportunities than the present site, we recommend that a permanent building be built on the present site. In the spring of 1923, to accommodate a larger output of fry, ten extra hatching troughs were installed in this hatchery, making twenty in all. This is not large enough to supply the district that is making requests for fish for Sequoia and General Grant National Parks, Tulare County, Tulare River, and lakes in the southern high Sierras. A hatchery with a capacity of at least sixty troughs should be built for this section. The total number of fry distributed from this station was as follows: In 1922, 435,000; and in 1923, 440,000.

BIOLOGICAL SURVEY OF LAKES AND STREAMS.

In an effort to improve the methods of stocking the barren lakes and streams of the high Sierra range, we recommend that a biological survey of the streams and lakes of the Sierra range be made and plans to stock this entire region be carried out as rapidly as money and fish can be had for this purpose. The region of the high Sierra range contains many thousands of lakes and streams that are barren of fish life. This region should be stocked with species of fish best adapted to the physical conditions of the streams and lakes as regards temperature, altitude and aquatic insect life. Many of the higher lakes of this region, particu-

larly the smaller ones, are residual glacial basins; and such should be stocked with a certain number of fry each season so that the people who are fishing these lakes will not have to depend on natural propagation, which is not feasible in some lakes as there are no tributary streams in which the fish may spawn, or springs welling up through the gravel near the shores in water not too deep for the fish to spawn. To determine the different species of trout best adapted to each individual lake, a biological survey should be made by some person specially trained for this kind of work.

The introduction of fish in these lakes without any scientific checking up of the physical conditions to determine the species best adapted to each lake would, in many instances, be a waste of time and money. After a survey of the physical conditions of these lakes is made, proper aquatic plants and insects should be introduced to improve the food supply for whatever species of trout is best adapted to each lake or stream where natural food is found to be lacking. The planting of trout fry in barren waters should be done under a system based upon a scientific survey of conditions necessary to get the best results when the fry are introduced. The planting of adult fish in small numbers in these lakes is not the best method of introducing fishes into barren waters. As said before, a great many of these lakes do not have proper spawning grounds for the species to be introduced, and, where such conditions exist, fry should be planted in sufficient numbers to insure fishing within a short period of time after the fish are introduced. Whenever, upon examination, it is found that the lakes do not contain proper spawning grounds, a certain number of fry should be introduced annually, or at least every couple of years, to maintain the supply in these lakes, depending on the number of anglers who visit these lakes each season.

An experienced fish planter, with a well equipped pack train, should have charge of the planting of fishes in these lakes after the biological survey is made. This would not entail a very great expense and many hundreds of now barren lakes could be made to furnish good fishing to those who care to enter the high Sierra range for their summer outings, as the rivers and lakes in the lower altitudes are being fished so excessively by the ever increasing population of this state, and, with the advent of the automobile, it becomes necessary to stock these barren lakes to meet the demand made upon our waters by the angling public. Therefore, we recommend that this work be taken up and continued until all of the accessible lakes and streams are stocked. This work should be done under the auspices of the Fish and Game Commission and carried on systematically until all of the barren lakes and streams are stocked with species of trout adapted to the conditions best suited for their development. Some of these lakes may allow the successful introduction of the Montana grayling. When this survey is completed, recommendations will be made to the board regarding the species that will thrive best in each lake or stream.

SCREEN SURVEYS AND INSPECTIONS OF POLLUTION OF INLAND WATERS.

During the last two years surveys of screens and fishways, and inspections of the same, have been carried on the same as in former years.

Two hundred fifty-three inspections of screens have been made and instructions given to the owners to repair, improve, or reinstall the same, where they have been removed from the ditches. One hundred forty-two surveys were made for screens, 82 being for new screens and 60 being resurveys where the time had elapsed for the installation of the screens and same had not been installed. Forty-one large rotary screen wheels were installed during the past year. The screen surveyor has investigated a great many plans for the impounding of sawdust and mineral refuse in many places throughout the state. In nearly every case where the streams have been polluted by persons, the nuisance was abated as soon as their attention was called to the law.

A number of the larger corporations have not complied with the screen law, and these cases are not in the hands of our legal department for court action. It is recommended that these cases be pushed to a speedy termination, as it is very important that all canals, ditches, and pipe lines, taking water from rivers or streams where fish have been planted or may exist, should be screened at as early a date as possible. The legal department should be given every assistance that our funds will allow in prosecuting offenders who will not cooperate with the Commission in installing properly designed screens. A number of the larger corporations feel that they do not have to abide by the law, claiming that the cost of the construction of the screens is of a great deal more importance than the fish destroyed by passing through their canals into irrigated areas and through power wheels.

The honorable C. J. Luttrell, of the superior court of Siskiyou County, issued an injunction against the Parker Cattle Company for not installing screens in accordance with the plans submitted by this department. As soon as the injunction was issued, the company got busy and installed the proper type of screen. This action of the superior court of Siskiyou County is highly commended and should be followed in other cases pending throughout the state, as the action of Judge Luttrell in issuing this injunction has established the fact that those diverting water from rivers and streams must comply with the law and thus preserve the fish life. In most instances this can be easily done at a nominal expense.

FISHWAYS.

Our fishway survey and inspection service has been actively engaged during the last two years in inspecting fishways and making surveys where deemed necessary for the installation of new fishways. Plans for a number of new fishways have been served on different companies and individuals owning and occupying dams, rivers, and streams, who have not complied with the law. These, also, have been referred to our legal department and court action will be necessary in a number of cases to force the owners to comply with the regulations. The same is true of a number of fishways in different parts of the state that have been built for a number of years; but, which, during periods of low water, such as has prevailed during the season of 1924, have not functioned.

A great many owners of water rights have refused to allow any water to pass through the fishways, closing them entirely in defiance of the law which provides that sufficient water must be allowed to pass through fishways at all times to keep in good condition any fish life that may exist below the dam, and that during the minimum flow of water in any river or stream sufficient water must be allowed to pass each dam, culvert, or waste gate to maintain fish life. This provision of the law has been disregarded by a great many persons and corporations who do not consider that the fish destroyed are equal in value to the value of the water for other purposes. Such a small amount of water is necessary to maintain fish life below these dams that this law should be enforced strictly. If the provisions of this law are not drastic enough to compel persons who are diverting water from our rivers and streams to allow sufficient water to remain in the beds of the streams to maintain fish life, the law should be amended by the next legislature so as to maintain fish life. This is only fair to the people who are interested in the preservation of fish and enjoy the fishing that these streams afford.

RECOMMENDATIONS REGARDING WATER LAW.

We have asked in several of our former reports for the cooperation of the Division of Water Rights, formerly the Water Commission, in not granting an appropriation of water from any stream unless a sufficient amount is allowed to remain to maintain fish life during the minimum flow. But these recommendations have been disregarded; and whether the Division of Water Rights is compelled to give all of the water to those asking for it in defiance of the rights of the people who have a right to the natural resources of this state, its fish and fishing waters, is not for this department to say. However, we respectfully recommend that some action be taken by our state legislature to investigate these conditions; and if, in their wisdom, they agree with our idea that sufficient water should be allowed to remain in the bed of every stream to maintain fish life during the minimum flow, and if the present laws are not stringent enough to meet the situation, laws should be enacted that will preserve to the people at least a small portion of the water flow that formerly existed in our streams, so that the fishing in many districts will not be entirely destroyed. If the rights of the people are to be protected, action must be taken by the legislature to make the penalties for the violation of laws pertaining to fishing and minimum flow of streams more drastic. In no instance, in our opinion, is it necessary to divert the entire flow of any stream, thereby causing the destruction of fish life below the diverting point. If a small amount of water is allowed to pass each dam it will maintain fish life during the period of minimum flow and fish could be kept alive until the period of normal flow. The greed of water users is well known; and they do not regard the rights of any other persons or those who have an interest in fishing.

A number of our lakes have been tapped and the water drawn below the natural level of the lake to such an extent that the fishing interests have been greatly interfered with. Consequently it is also recommended that a law be passed preventing the tapping of any natural lake below its outlet. If it is necessary to take a greater amount of water from any lake than the regular discharge of the lake through its outlet,

dams can be constructed and the water level raised to impound the surplus water. This practice of tapping the mountain lakes to increase the flow in the outlet streams for power and other purposes will soon cause considerable damage to our fishing streams. Those who are capitalizing the water for power can well afford to construct dams to raise the water, if it becomes necessary to hold back a surplus supply for the low water period, instead of tapping the lakes and thus causing damage to our fish life.

Many other recommendations could be made on the subject of the preservation of the fish for inland waters; but, until some action is taken to regulate those who are taking water from our streams, we do not deem it advisable to make any new recommendations regarding the conditions that are detrimental to the lakes and streams of our state containing fish life.

Respectfully submitted.

W. H. Shebley,
In charge Department of Fish Culture.

REPORT OF THE DEPARTMENT OF COMMERCIAL FISHERIES.

The Honorable Board of Fish and Game Commissioners of the State of California.

Sirs: In our last biennial report we told of the decline in the volume of California's fisheries products during the years 1920 and 1921 after a phenomenal growth of our fisheries which reached its peak in the year 1919. The most rapid growth was in our sardine fisheries, located at Monterey, San Pedro and San Diego, and the main stimulus was the export demand caused by the Great War.

In 1919 the sardine catch in California exceeded 150,000,000 pounds, nearly all of which was put into pound oval cans, the great bulk being for export. With the slump in prices in 1920 coupled with the collapse of foreign exchange most of our sardine canners were soon in distress. There was an overproduction of canned sardines in this country and foreign countries could not pay a price which would give our canners a profit. It so happened there was a good demand for fish meal and fish oil—the by-products of the sardine canning industry—and that more of a profit could be made by using the sardines for reduction purposes than by putting them in cans for food. As practically every fish cannery in this state has a reduction plant for handling the fish offal from the canning operations, the canners were naturally anxious to run these reduction plants to capacity.

The so-called Fish Conservation Act passed in 1919 prohibited the waste of fish or the use of any food fish except fish offal for reduction purposes without first obtaining written permission from the Fish and Game Commission. In the prosecution of the sardine canning industry there is an unavoidable waste of fish, such as broken and soft fish or fish too large or too small to pack properly. The fishermen frequently make over catches which it is impossible to avoid. The written permits to be issued by the Fish and Game Commission as provided in the law, were intended to cover these unavoidable contingencies.

The difficulty was in determining what was unavoidable waste, especially in the case of soft, broken and off-sized fish discarded by the fish cleaners in selecting the fish for canning. It was a comparatively easy matter for a canner to discard half of the catch in this manner to his own great advantage and it was difficult to prove it constituted unnecessary waste.

If a canner could make a sufficient profit on his reduction or by-products plant, he was able to cut down the price of his canned sardines to a point where they could be sold for export and thus he could find an outlet for the surplus production. The Fish and Game Commission whose duty it was to enforce the Fish Conservation Act had great trouble in doing so for the reason that the law did not adequately cover the emergencies which arose. It seemed desirable that the sardine canners be permitted to use a larger percentage of the catch in their by-product plants where the profit lay, in order that they might be able to dispose of their surplus canned goods at a low price in foreign markets, and thus be able to weather the storm until foreign countries could pay more, or until a better home market could be developed.

With this in mind, the canners and the Fish and Game Commission got together and had the act amended in the 1921 legislature. It was then provided in the act that the canners, if they wished to use food fish for reduction purposes, could make application to the Fish and Game Commission whereupon the Commission must hold a hearing for the taking of testimony and if it was shown that there was no other market for the fish and that using them in a reduction plant would not tend to deplete the supply, the commission could give permission to use an amount of fish for reduction purposes, of not to exceed 25 per cent of the capacities of the plants making application. Beginning with the fall season of 1921 the Fish and Game Commission has, under the amended act, given the sardine canners a definite percentage of the catch for reduction purposes, the percentage to cover everything not used for canning except the fish offal. Experience has proved that the amended act is no easier of enforcement than the old act. Even with an efficient corps of inspectors to watch the different canning plants it has been impossible to satisfy the law-abiding ones that unscrupulous canners are not getting an advantage over them for the competition is exceedingly keen not only between individual canners but between the different sardine canning districts. If a canner quotes a lower price than the others, it is believed by those who are unable to meet this low price that he could not do it unless he was using more fish in his reduction plant than the rules allowed.

There are too many ways in which the Commission's order, fixing the percentage which can be used for reduction purposes, can be avoided. In case of a violation of the order of the Commission, it takes too long to stop the offender.

The Fish Conservation Act should be redrawn and the hearings before the Commission eliminated. The amount of fish which it is legitimate to use for reduction purposes in the process of canning can be definitely fixed in the law. A violation of the law should be a high misdemeanor and the goods manufactured in violation of the law should be subject to seizure by the state.

There is no doubt but that the present law giving a more liberal amount of fish for reduction purposes has enabled many canners to survive, who would otherwise have perished, but there is also little doubt but that permitting a certain per cent of the catch to be used for reduction purposes has resulted in the lowering of the quality of the canned sardine pack. In order to get the fish for reduction purposes most of the canners have lowered the quality as well as the price of the canned pack. For the export trade price is what counts and the quality does not cut much figure. The quality of California canned sardines must be built up. We therefore recommend that the amount of sardines which may be diverted for reduction purposes be limited to what is absolutely necessary in putting up a good pack and that this amount be definitely fixed in the law.

In our last biennial report we said that the sardine industry showed decided signs of reviving during the winter season of 1921-1922. This revival was more marked in the two seasons which have passed since that time. The catch is again very near that of the banner year of 1919. Several of our sardine canning companies have failed and others no doubt will fail before the industry is again on a firm footing. But the crisis has passed and as soon as the industry can be freed from the demoralizing tendency to make profits out of the by-products plant and to sell the canned product below cost it is bound to have a healthy growth.

PURSE SEINE FISHERY.

The purse seine fishery of southern California was dealt with in our last report and our prediction that there would be a fight at the last legislative session against the use of purse seines was fully borne out. Those opposed to purse seines claimed they would eliminate them as a conservation measure, but we are not quite sure that the basis of the opposition was economic. It is the ancient objection to a new method or appliance which upsets the old order. The situation was investigated by Dr. Tage Skogsberg, one of our fishery assistants. Unfortunately, his report could not be published in time to be read at the last legislative session. It is possible that if it had been published and available, the measure eliminating purse seines would not have passed. As the bill was vetoed, the matter is soon to be brought up again. There was a good deal of misunderstanding amongst the legislators as to what were the real facts in the case. Since that time Mr. Will F. Thompson has written a condensed review of Dr. Skogsberg's report which was published in California Fish and Game, Volume 9, pages 87-98. This review and the complete report, which is now ready for the printer, should clear up the points at issue and enable the legislators to get a clear understanding of the situation.

The report points out the necessity of carrying on a biological investigation of the principal species of fish involved in the dispute, especially the barracuda. This investigation would be along the lines of the investigations now being carried out in the case of the tuna and sardine. As such an investigation is required by law, we hope to start the work as soon as finances will permit.

STRIPED BASS AND SHAD.

The last legislature passed measures which give striped bass and shad considerable added protection. During the last five years the annual commercial catch of these two species has gradually increased in spite of a number of restrictions on commercial fishing. It is quite certain that shad are becoming more plentiful and the closing of the last half of May to shad fishing in addition to the closed months of June and July may result in bringing them back to their former abundance.

Although the commercial catch of striped bass is increasing in spite of the added netting restrictions, it is not so easy to convince anglers that they are not actually becoming less plentiful or even scarce. Closing the last half of May to netting for striped bass, the same as shad, is a very good added protection and it is our opinion that the present laws are adequate for a few years at least.

SALMON.

The salmon, unlike the shad and striped bass, are not sufficiently protected against the drain of commercial fishing. Prior to the last legislative session, conferences were held between the salmon fisheries interests and the Fish and Game Commission and important restrictions were agreed upon which were designed to eliminate net fishing on the Sacramento River above the city of Sacramento; to eliminate all river and bay salmon fishing during June and July; and to restrict outside ocean trolling for salmon to those months when few immature fish are caught. These restrictions were all passed by the legislature but unfortunately a flaw which had remained undiscovered in the law for two years, was not detected until after the bill was enacted into law. This flaw has resulted in nullifying the closed seasons on the sea trolling. This was unfortunate for the establishment of closed seasons for salmon trolling in the sea was the most important part of the salmon conservation measure. Each salmon fishing district, from the ocean to the upper Sacramento and San Joaquin rivers were to be restricted so that the catch in each district would be cut down about 25 per cent. It was believed by all that this cut in the catch was absolutely necessary in the districts frequented by Sacramento salmon. All were agreed that it was most important to close those months in the sea districts when most of the salmon caught are small and immature.

Investigations carried on for several years under Professor J. O. Snyder, showed that the troll caught salmon in the sea are mostly small and immature except during two or three months at what is known as the height of the season. These favorable times, when most of the salmon which are caught are large and mature, were determined for each sea district along the coast and closed periods determined to prevent the catching of immature fish. The closed seasons would have cut down the total annual catch in pounds of salmon in each sea district about 25 per cent, but if we should estimate it in numbers of fish it would have been nearer 50 per cent. Commercial salmon trolling is of comparatively recent development. The old established salmon fisheries are on the bays and rivers. The bay and river fisheries are the ones which have had their fishing operations restricted. The salmon troll

fishery has been an added drain on the salmon supply with the result that the fishing restrictions in the inland districts have not been sufficient and the salmon supply as indexed by the number of fish which reach the spawning grounds in the upper Sacramento River has fallen off more than one-half.

The bay and river fishermen believe that all sea trolling for salmon should be stopped; the salmon trollers think that after the salmon get into the bays and rivers on their way to spawn they should be protected. There are a good many arguments on each side of this question but, it is our opinion that the preponderance of the evidence is against the outside or troll fishing. Washington and Oregon have stopped the outside salmon fishing both for trolling and purse seine fishing, and their opinion that we are unwise in permitting outside salmon fishing is backed up by the United States Bureau of Fisheries, which is deeply interested as it maintains extensive salmon hatcheries on all the most important streams.

We recommend that the present salmon law be redrawn so as to eliminate present errors and in order to cut down the outside trolling season as far as is necessary to prevent the destruction of immature fish.

PATROL.

Our present commercial fisheries patrol service as described in former reports is sufficient to enforce the fisheries laws with only one or two exceptions. The law passed by the last legislature prohibiting the possession of trawl or drag nets in the southern California districts has made the patrol work of that district so much easier that the one patrol boat we now have there, the "Albacore," should be able to take care of all of the sea patrol work in southern waters without the aid of another boat. In the waters from Monterey Bay to the north we are in need of a seaworthy boat for patrol. Recent experiences in trying to enforce the salmon and crab laws convince us that it is absolutely essential that a seaworthy boat be procured. We recommend again that the patrol boat *Quinnat* be sold and that it be replaced by a seagoing patrol boat.

INVESTIGATIONS.

The fisheries research and investigations of the department have been carried on mainly by the staff of the State Fisheries Laboratory under the direction of Will F. Thompson. Mr. Thompson's laboratory report is herewith presented.

In addition to the investigations of the laboratory staff, salmon investigations have been continued under the direction of Professor J. O. Snyder and by one assistant. Some of the results of this work have appeared at intervals in California Fish and Game. As a result of these investigations, we have been able to fix quite accurately the times of the year which should be closed to salmon fishing in the sea districts so as to prevent the destruction of small and immature salmon. This could not be determined except by an accurate analysis of the catch at the different fishing centers. Extensive marking experiments have been carried on which are shedding much light on the range at sea of the salmon from the different rivers. This knowledge

is necessary if we are to properly regulate the river and sea fishing for salmon. We recommend that this work be continued and be made part of the present program.

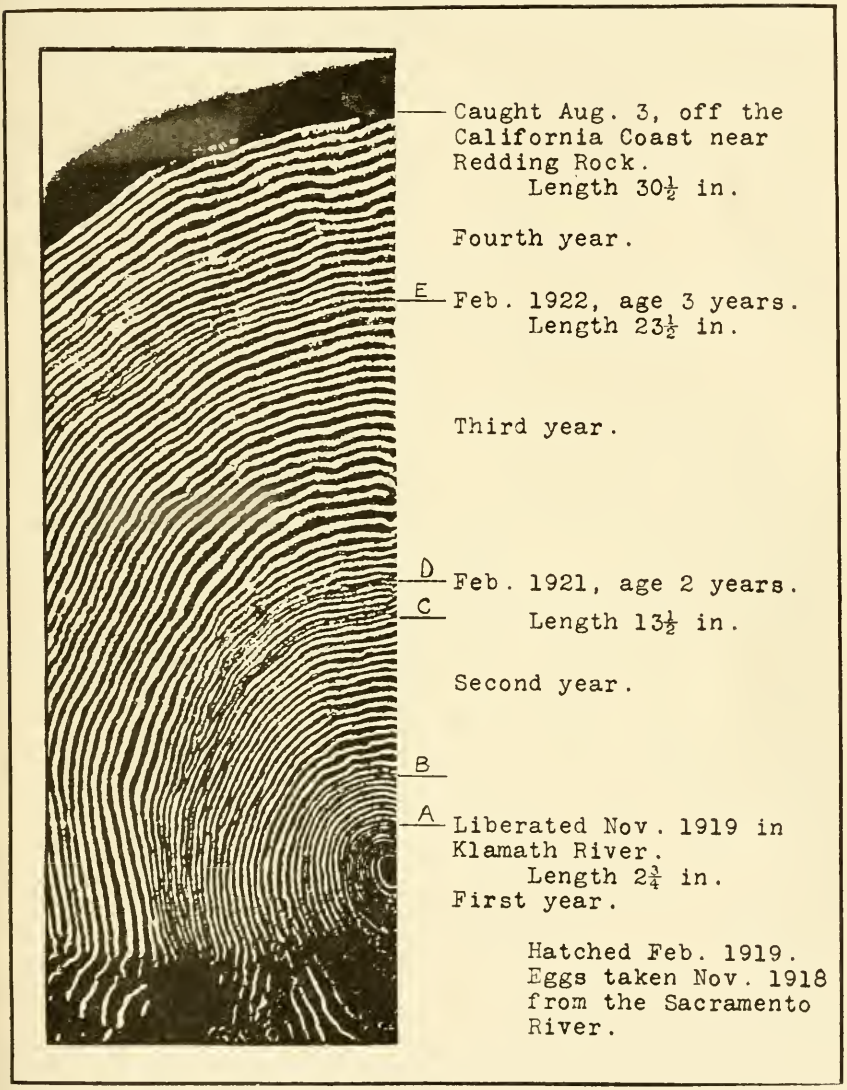


FIG. 11. Photomicrograph of a scale of a king salmon of the 1919 marking experiment indicating age and rate of growth. Photograph by J. O. Snyder.

THE COLLECTION OF STATISTICS.

The statistics collected by the Commission are for the purpose of detecting overfishing in case it occurs, and for the study of the great natural changes which occur in the abundance of the fish. It is, perhaps, not generally known and appreciated that fishery statistics in general are very defective, so much so, indeed, that it seems futile to

even attempt to use them in discussing the condition and the liability to overfishing of such great fisheries as those for the sardine or herring. This is all the more true in that until recently no data have been collected to throw light upon those great natural changes which confuse all present attempts to detect overfishing in such species as the sardine. To emphasize this fact we give the views of one of the greatest French authorities, Louis Fage, on the sardine, an opinion which may, in greater or less degree be held true of almost all great fisheries.

As Fage remarks, the available work on the sardine indicates that while the insufficiency of our knowledge of the sardine is due in large part to the lack of method and correlation in research, it is also due to the lack of available records as to the course of the fisheries and the fluctuations in their returns. Many of the questions which arise must be solved solely by statistics, which must be well made and comparable; and, as he says emphatically, it is astonishing to note the insufficiency of statistics for such a great fishery. Those of France have had their basis changed thrice, those of Portugal are based on sale prices, those of Spain and Italy are nonexistent, while the statistics in England, although good, are very recent. He enumerates the facts which should be included in these records, and are not, such as the monthly landings, the dates of appearance, the average sizes, etc., and ends with a statement the truth of which must be recognized, "La statistique bioloque de la pêche, telle que Hjort (1914) l'a définie, devra s'imposer, tôt ou tard, à tous les pays soucieux d'exploiter rationnellement leurs mers".* (Biological statistics of the fisheries, such as Hjort has defined, must be collected sooner or later by all the countries desirous of exploiting their seas rationally.)

The statistics which the Commission is collecting are of the nature required for the following of the actual catch as it shows the abundance of fish, and for the study of the natural changes occurring. They are therefore of two kinds, of equal importance.

One kind deals with the *amount of the catch*, giving not merely the grand total, but also the catch per boat, with the species, place of landing, etc., and can be compiled day by day if desired. This type of data is that which is mentioned in the above quotation as so lacking in the sardine fisheries. The California statistics of this kind are gathered by means of the carbon duplicates of fishermen's receipts for fish delivered to the dealers or canners. This system is described in greater detail in a previous biennial report. (Biennial Report of the California Fish and Game Commission, 1918-1920, pp. 56-58.) It is cared for by assistants of the Commission in San Diego, San Pedro, Monterey and San Francisco.

This year has seen the statistics for the fifth successive year correctly filed and deposited in the State Fisheries Laboratory for safe-keeping. The records are filed by the name of the individual boat, year by year, and it is possible from them to trace the size of the daily catches for any species at any time. The total take by locality has been regularly reported every three months in the quarterly publication, California Fish and Game, by an assistant devoting his time to such work. More detailed statistics are being at present compiled for the albacore fishery by two assistants engaged under a co-operative agree-

*Danish Oceanographical Expedition, *Clupeidæ*, 1920.

ment with the Bureau of Fisheries. These statistics are, we believe, very accurate, more so than those collected by any other government, and should be of especial worth as giving the individual catch per boat, upon which any real comparison of abundance in successive years must be based.

This system, being unique, and original, has had its troubles in getting started, there being no precedents to guide in the collection and filing of the "pink tickets" as the duplicate receipts are termed. There is at present, however, no doubt but that this system is now in full working order.

As has been found in Europe by bitter experience, these data as to the catch per boat must be interpreted in the light of the nature of the boats and their equipment. Any change in the catching power of a boat necessarily conditions the comparison of its catches from year to year. Therefore, change in gear employed must be carefully watched. With this end in view the Commission has, in accordance with a law providing for it, required the registration each year of the boats and their gear. Necessarily incomplete at the start, each year has seen the list of boats registered more complete, as they have returned to fishing or as new boats have been put into use. This forms a natural complement to the records of catches landed, and is indispensable.

From these records of catches and of boats used, there are incidentally compiled the usual form of statistics as to total catch by periods and by localities, as well as by species. The obtaining of such totals is, it is pointed out, entirely incidental and does not serve the primary purpose of the work, the furthering of our knowledge of the abundance of the various species concerned. It does, however, provide a measure of the commercial importance of the industry, and is of interest to the public. Such statistics have been issued by the Commission, as noted above, for each quarter of the year.

The second type of statistics are in Europe termed "biological statistics." These are taken by means of samples of the catch, and show the *varying composition of the same in regard to sex, size, etc.* They are indispensable in understanding the great natural fluctuations which occur, for those great fluctuations are characterized, and indeed consist of, changes in the internal composition of the catch. Examples of their great usefulness are found in such fisheries as the herring and salmon. These statistics are at present being gathered in two great fisheries, that for the sardine and that for the albacore, by the State Fisheries Laboratory, and the results are being properly organized for use by the assistants engaged.

It is regrettable that such biological statistics have been collected for but two fisheries, but the time and thought necessary to organize the proper methods have been too much to permit of branching into more fields. Now, however, that the possibilities and necessities of these two cases are well known and can be embodied in a formal routine, it may be possible to enlarge the scope. It is, however, necessary in each case to carefully survey the data obtainable and to carry research far enough to decide upon what the main changes to be expected are. It is also necessary to decide what amount of sampling will correctly define the characteristics of the catch which must be followed during their changes.

It must be remembered that putting these systems into actual practice is no mean achievement. Adequate statistics of this sort have been so rarely attempted that the principles and organization necessary have had to be discovered by experience, as will be particularly shown in the forthcoming report upon the sardine.

We are sure, as a result of this work, that the administration of our fisheries in California is upon the best and most modern basis possible. And although the results of this may not at their inception be spectacular, they will and are proving themselves the indispensable, solid basis which is at present so entirely lacking for European fisheries.

The collection of biological statistics (the second type) is a function of the State Fisheries Laboratory. A report on its work in connection with these and upon biological questions follows, dealing, however, only with the accomplishment of the first stage in the digestion and analysis of the accumulated data. The collection of these statistics as a whole must proceed as routine duties. They have been regularly performed, and results will follow from them in due time.

Respectfully submitted.

N. B. Scofield,
In charge Commercial Fisheries.

REPORT OF THE STATE FISHERIES LABORATORY.

PERSONNEL.

Since the submission of the last report very great changes in the personnel of the laboratory have occurred. The consideration of these changes will indicate certain alterations which necessarily have to be made in program and in organization in order that the work will continue and be fruitful; and it will explain certain limitations which have been put upon the work.

Upon the employment of Mr. W. F. Thompson to direct the scientific work in southern California, it was necessary to obtain and train assistants, since none already trained were obtainable. Mr. Elmer Higgins, Mr. W. L. Scofield, Mr. O. E. Sette, Mr. Harlan B. Holmes, Miss Frances N. Clark, and Dr. Tage Skogsberg, comprised the staff of the State Fisheries Laboratory at the time of the last biennial report. All of these had received their training in fisheries and statistical work in the State Fisheries Laboratory, and they had at that time reached a stage in their training which promised well for the future. All of these assistants, with the exception of Mr. W. L. Scofield, have, however, now left the Commission, either for the service of the Federal Bureau of Fisheries or for work at universities. It has become very apparent that the retention of these assistants when fully trained will require a higher standard of salary and greater provision for permanency of employment than at present offers, since there is very obviously a shortage of such men in the United States.

It has been realized that the training of these men has been an accomplishment which can not fail to be of importance to the progress

of fishery science, and it has at the same time been found that the work finished during the period of training has been of high order. It can not be expected that reports of scientific work accomplished can be produced readily by men who have never before done original research, but what is produced ranks high in freshness of viewpoint and thoroughness of treatment. There need therefore be no regrets for the time and effort spent in training these assistants, and there has been no hesitation in starting the training of a new group.

It must at the same time be realized that such a process can not go on indefinitely. The direction of such work becomes a difficult task, and will become increasingly so, since it is well-nigh impossible for the director to specialize in all of the several lines to the necessary extent. Sooner or later mature investigators must be retained to make at least a working nucleus.

It is necessary for a competent fisheries investigator to be trained in a highly technical way. He must have instruction and drill in the classification and anatomy of fishes, in the methods of determining age, growth, spawning habits, and in the collection of data and in its handling according to modern statistical methods. In addition he must be widely read and well informed in the fisheries work of foreign countries, and in knowledge of distribution of life within the ocean. To this end considerable time must be expended by each assistant along these several lines, as their relation to the problem upon which he is engaged becomes apparent.

There have now been appointned as new members of the staff Mr. Harold H. Greene, Mr. W. A. Selle, and Miss Ruth R. Miller, who, with Mr. Thompson and Mr. W. L. Scofield (resident at Monterey), make up the present staff.

In addition there have been appointed two assistants under a cooperative agreement with the Federal Bureau of Fisheries. The text of this agreement is incorporated in the following letter:

April 22, 1924.

Mr. Will F. Thompson,
State Fisheries Laboratory,
East San Pedro, California.

My dear Mr. Thompson: The suggestion has recently been made that the Bureau of Fisheries might well cooperate with the California Fish and Game Commission in the work which you are doing. We are interested in doing this for two reasons: First, in order to aid in the important investigations of the sardines and tuna which you are making; and second, in order to provide an opportunity for more young men to be trained under your supervision. I appreciate very keenly the good work which you are doing and especially the remarkable success which you have had in interesting younger workers in fishery investigations and in giving them a broader viewpoint of fishery matters and a knowledge of, and experience with, the best methods for attacking the complicated problems involved in work of this character. As you well know, it is, at the present time, extremely difficult to get men properly trained in fishery investigation or men capable of collecting and studying fishery statistics.

It is proposed that we reserve out of our allotments for the fiscal year of 1925 (July 1, 1924, to June 30, 1925) a fund of $2,000 to be expended in the employment of two men to work under your supervision. One thousand dollars of this is to be allotted from the appropriation of Scientific Inquiry and is to go toward paying the salary of a man to work on an investigation of the fisheries of California. Another $1,000 is to be allotted from the appropriation of the Division of Fishery Industries and is to go toward paying the salary of a man to work on the statistics of the fisheries of California. The California Fish and Game Commission may pay as

much more in the way of salary to these men as it desires. The selection of men will be left to you, but it is suggested that they be either college graduates or men in their senior year; and preferably men who will be interested in engaging permanently in fishery work. If you are unable to secure competent ones we will try to find men on the east coast who are capable. It may also be possible for us to send out one of the men on our regular staff who can profit by the training you may be able to give. There is to be no restriction, so far as the Bureau of Fisheries is concerned, upon the activities of these men—both are to work as you may direct. The only thing we ask is that whenever the positions in the Bureau are made available they shall feel free, so far as the California Commission and yourself are concerned, to accept.

A copy of this letter is being sent to Mr. Scofield and if the proposed plan meets with his approval and yours, the necessary funds will be reserved and will be available for use after the first of next July. If the plan works successfully it is our desire to continue it during future years.

Very sincerely yours.

(Signed) HENRY O'MALLEY,
Commissioner.

There is no short cut to knowledge or to the accomplishment of research, which is the extension of the boundaries of knowledge.

The director has therefore at the present time found himself not merely responsible for his own research, but for those of his assistants as well. It is fortunate indeed that students of high enough caliber can be secured to render this course feasible.

ASSIGNMENT OF PERSONNEL.

The work done during the past two years has been moulded to a very appreciable extent by these changes in the staff. Previous to the departure of the assistants who have left our service, every endeavor was made to bring their work to the point of publication. This was in itself a rather difficult matter, as anyone familiar with the vicissitudes of research will recognize. The net result was a temporary concentration of attention upon the sardine reports, since the resigning assistants were engaged thereupon, but the field work was not neglected and the continuity of our records of the fishery has not suffered. The publication of the work on the albacore has, however, been badly delayed.

Now that the sardine work has been brought to the completion of the first publication, the available new assistants have been concentrated upon the albacore data, leaving two to carry on the sardine field work at Monterey and San Pedro. Whether the analysis of the albacore catch can be completed in time to be of use this coming session of the legislature remains to be seen. No effort will be spared.

SARDINE WORK.

The first stage of the sardine work has now been completed and the reports thereon are now at hand for printing. The significance of what has been found needs to be emphasized and clearly explained, because it points the way to the future of the work and indicates certain possibilities in regard to the future of the industries dependent upon the sardine.

The stated purposes of the investigations have been fully outlined in previous Biennial Reports, in Fish Bulletin No. 2 and in Fish and Game, Vol. 6, pages 10–12, 32, 83, 180–182. They include: (1) The detection of depletion; (2) the discovery of whatever great natural fluc-

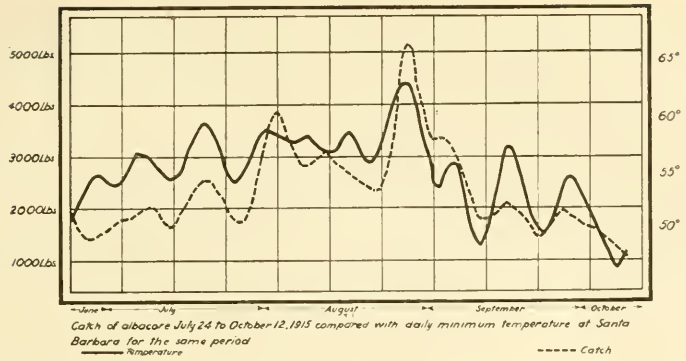


FIG. 12. The catch of albacore varies with the temperature. In this graph, temperature data have been set back three days so that that for July 27, for instance, appears on the same ordinate as does the catch recorded for July 24.

tuations occur, whether in abundance or in quality; (3) the foretelling of these fluctuations; (4) the analysis of whatever migrations occur, in order that the interdependence of fish of different regions may be known, and (5) the foundation of measures for protection in case depletion should occur.

Of these purposes, the second, although naturally not of greater importance, must precede all the others. It would be impossible to detect depletion, were the natural changes unknown; and, as is made very clear in the law under which we work and in our published papers, the conservation of our fisheries must be set above all else. The thorough understanding of the natural changes leads to their foretelling and to the assignment of the proper causes for instances of decline in abundance. The analysis of the migrations is necessary primarily in

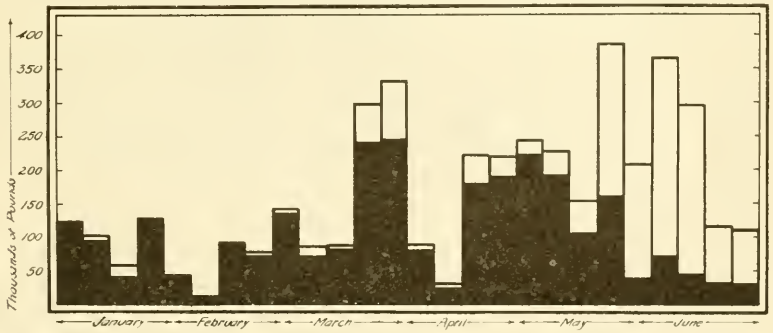


FIG. 13. Comparison of the amount of barracuda, white sea bass, and yellowtail caught by purse seiners and that taken by other boats. Black: Weekly landings by purse seiners at San Pedro, 1922. White: Weekly landings by other boats at San Pedro, 1922.

order that the extent of the effect of overfishing or of natural overabundance in a given locality upon other localities, may be determined.

It is nevertheless true that the discovery and correct definition of the great natural fluctuations in abundance is an end in itself. They must

be of great economic importance to the trade, because upon them depends the success or failure of the fishing, and their assignment to natural causes must be an insurance against rash and ill-advised restrictive legislation.

In these first reports upon the sardine it has been sought to accurately indicate the actual changes which occur, regardless of traditional beliefs regarding the species, and it has been sought to emphasize the fact that the present work is part of a permanent program; that not only does conservation of marine fishes require the eternal vigilance of a well-handled statistical system, but that the understanding or foretelling of natural changes requires continuous study.

SCOPE OF THE REPORTS.

It must be understood before the findings of the work are presented, that a rigid adherence to a practical end was insisted upon from each of the assistants. This, the understanding of the commercial catch, necessitated first of all the accurate portrayal of that catch as it actually existed. It was realized that a theory is of no use if the thing it is supposed to explain does not exist, and that a secure basis of fact must exist for any theory. Therefore, instead of presupposing a complex of migrations and miscellaneous phenomena to which almost anything could be assigned, and which fishermen's theories and observations should be regarded as proving, it was sought to impartially and rigidly record the facts of the run of fish. Our reports are, therefore, not attempts to explain phenomena which we merely suppose to exist, but they are records of what phenomena actually do appear.

The first and most natural step in such a rigidly scientific procedure, was to find out how extensive our records must be to show the tendencies we desired to analyze. The only feasible way to accomplish this was to make sure that we had determined these tendencies as nearly as might be, by securing an excess of records. Then, by breaking these into independent series and comparing them, the degree of divergence one from the other would indicate to what extent the catch was distorted by reducing the extent of the record. Were two entirely independent series of samples of the catch similar in what they showed, then the inference is fair that what they indicated must be the truth. This is the phase of the problem dealt with by Mr. Sette.

Mr. Sette has shown that to obtain a picture of the year's catch which is sufficiently correct to use, it is necessary to sample the commercial catch twice a week. He has shown that systems of sampling used by other investigators upon the herring would be entirely inadequate in the case of the sardine. In coming to this conclusion he was not aided by any analysis of their own methods made by these investigators and we believe that our analysis of what is necessary is one of the first to be made for any great fishery.

Upon this basis of what we knew was necessary, the remaining reports are made by Mr. Elmer Higgins, Mr. W. L. Scofield and Mr. W. F. Thompson. They constitute a presentation of the commercial catch as a rigid system of sampling shows it.

Mr. Higgins and Mr. Scofield show that there is a well-marked change in the catch from year to year and that the abundantly represented sizes shift in a consistent way from year to year. This change is due

to the incoming of abundant groups of sizes, which then from year to year increase in length until lost in the mass of larger fish. They furthermore show that there may be periods several years in length during which the spawning is relatively unsuccessful. They can not, however, follow the progress of these groups above twenty-two centimeters.

Their data show the passage of but one of these periods of poor spawning, and there is no ground as yet for assuming any definite regularity in the appearance of this phenomenon of dominant and suppressed groups. On the contrary it is expected that these periods of nonsuccess in spawning will vary greatly in length, and that at any time there may ensue periods of such length as to, for the time being, practically sweep out of existence the sardine fishery—for the smaller sizes at least. This same thing has happened in European herring fisheries. The advantage to the canners of keeping their product diversified should be plain.

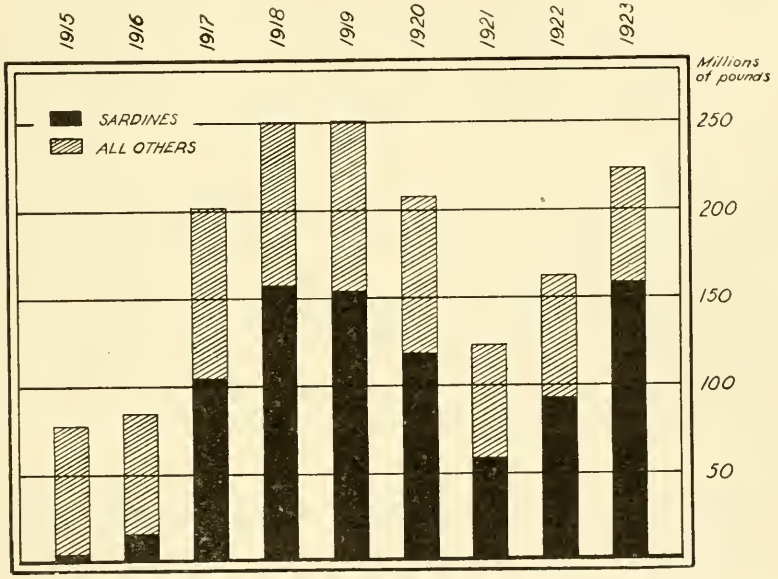


Fig. 14. Amount of sardines in total California catch, 1915-1923.

It was also attempted by Mr. Higgins to correlate the sizes of sardines taken with the numbers of fish packed in the pound oval cans. He reports that the changes observed in the catch by our sampling methods are reflected in the pack of the canners. It is therefore possible to prophesy the take. A tentative effort at prophesying the catch during the season 1923–1924 was successful at San Pedro. There is nothing at all remarkable in this, considering the firm basis upon which our records are founded, and it is the conviction of the staff that we may look forward with assurance to the time when very definite and valuable forecasts can be given the canners. It is, however, felt that considerable caution is yet necessary in the use of this possibility.

An examination of the data from San Pedro by Mr. Thompson led to a report upon the extent to which the changes could be followed. The net result was to show that there is a certain independence between the fisheries for large and for small fish. This leaves it doubtful whether a class which was dominant during passage through the smaller sizes would remain so during passage through the larger sizes. A certain year group might appear to be very abundant while it is among the smaller sizes, simply because the few age groups with which it would be compared are on a low level of abundance. But upon becoming one of the large sizes which run during January and February the age groups with which it is contrasted are many more in number and may include among them equally dominant ages. There is, therefore, a necessity for careful observation as to just how far these conditions limit the prophesying of the catch.

There is also room for thought in regard to just how far these phenomena limit our ability to detect depletion from overfishing. In discovering this it is necessary to rely upon two criteria which can not well be considered separately. The first of these is naturally the decrease in actual numbers of fish in the ocean. The second is a decrease in the average length of life of the individuals, or, in different words, the decrease in relative numbers of old fish, a decrease in the proportion of survivals.

The presence of this great variation in numbers contained in a year class, which we have termed the phenomenon of dominance or of suppression, at once raises the question as to whether a lack of fish is due to the "natural" lack of success in spawning the younger fish, rather than to overfishing. This "natural" lack, however, would be accompanied by a greater abundance of the older fish, overfishing by a lesser abundance. The phenomena of dominant age groups, which we have demonstrated, therefore throws the burden of proof of overfishing upon the second criterion, namely the decrease in average length of life, which would accompany the greater death rate caused by intensive fishing.

The determination of the average length of life involves a comparison of the young and old age classes. In many species it may well be a fair presumption that the younger age classes are always of approximately the same abundance, the success of spawning not varying, so that at any given time the percentage of survival at a greater age may be determined at least approximately by the direct comparison of that older age group with the younger ages present. However, as we have shown in the sardine, the nature of the fishery and the errors in the necessary method of sampling, effectively preclude a reliable comparison of the smaller and larger fish, which represent the young and old.

There is, then, no choice for us in our observation of the sardine fishery, save to rely upon following each year class through its life history, and to compare its abundance at each stage with an average obtained by many years' observation. The difficulties in so doing are manifold. We have therefore come to the conclusion that it is better in the case of the sardine to frankly face the possibility that we may not be able to detect overfishing until that overfishing has progressed farther than it might be wise to allow.

It is entirely possible that some such inadequacy of data lies at the basis of the prevalent idea that "pelagic" species such as the herring are inexhaustible.

I would therefore like to propose in this biennial report the use pending the perfection of our knowledge, of the only alternative method possible, which is regrettably crude. This, the direct observation of the fishing methods, with careful record of place of fishing, apparatus, methods, and sizes of catches, should allow us to roughly compare at any desired time the relative difficulty of taking the two classes of fish, old and young. These two classes run at different times of the year, and these observations should allow us to make some estimate of their actual abundance relative to one another. In other words, our work has shown us that instead of observing a single unified fishery for the size of the catches and duration of life, we find ourselves compelled to correctly determine the catches in two more or less independent phases of the fishery, and to compare the course of the two. This is a more fundamental and more difficult task than one would realize at first glimpse. It throws a very great responsibility upon those having in their care the collection of fishery statistics and the observation of fishery methods. But could it be shown that the fishery for old fish is persistently on a decline in comparison to that for young fish it would be fair to presume overfishing, unless change in methods or apparatus accounted for the increase in young.

However, to summarize the whole, there can not be a shadow of a doubt that the securing of more refined evidence may be delayed beyond what it should be—our work has clearly indicated that to the writer. It may well be that our research, carried further, will clear this matter up and provide means whereby depletion can be detected at an early date. Thus our studies upon the seasonal run of fish may show that at some one part of the season the various classes of fish are all represented at once, and that a correct evaluation of their relative abundance may be obtained. In fact, the development of our knowledge and the per-

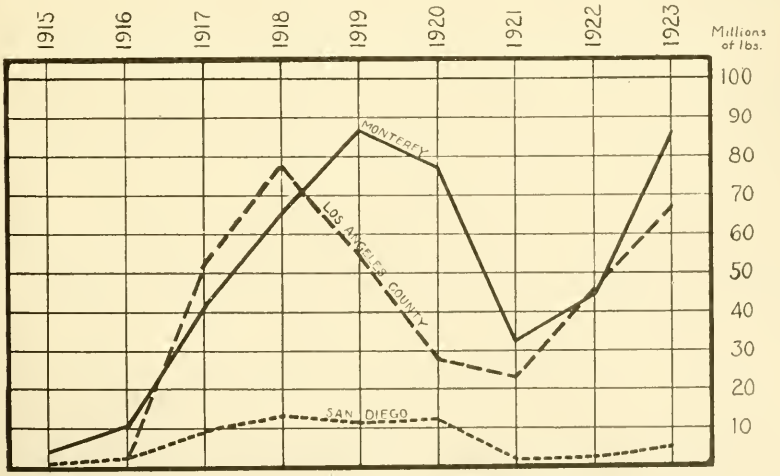


FIG. 15. California sardine catch by statistical districts, 1915-1923.

fection of theory may lead ultimately to the accurate observation of the condition of the species. No trouble or expense should be spared to accomplish this end, since the sardine fishery promises to increase far beyond its present bounds, and since the problems to be met with in the sardine investigation are faced in other great fisheries, but have never been solved.

The sardine is a source of food for almost all our other great fisheries, such as the albacore, barracuda, sea bass, and tuna. Tampering with its abundance may result disastrously to many interests—and in the absence of any clear-cut and sensitive method of detecting overfishing, the greatest caution must be used. The writer has convinced himself that unnecessary drain upon the supply should be avoided until research has shown that it is possible to detect overfishing in time, and for that reason it is his belief that the use of sardines for fertilizer should be emphatically condemned, and a more conservative growth of the fishery awaited. Were we considering the use of the water in a great river, would it be wise to recklessly disregard all the industries which might be dependent upon the uninterrupted continuance of its flow? Would it not be wiser to use the water only when its use was clearly more valuable than the industries dependent upon it?

And in the meantime, the need to develop our technique of detection of overfishing can not be too emphatically stated. No other agency than the state government is in a position so to do, and no government has as yet succeeded in developing such technique, or indeed, made any thorough attempt at it.

The program of investigation of the sardine has, however, indicated that the prophesying of the commercial catch a short period in advance is possible and feasible and there is every prospect that further study will refine and perfect our methods. This is indeed fortunate, as hope of detecting overfishing in the future depends upon the thorough analysis of the catch, an object that is justified by its practical results alone.

This analysis of the catch will accomplish another important end, namely, the clear understanding of the cases in which success in spawning is lacking for a number of years, causing fish to become scarce, and bringing into existence an urgent popular demand for radical restriction of the fishery. In such cases it is going to be possible to show that the older fish are not particularly affected by the particular cause of the scarcity, and it should be possible to prophesy the restoration of the fishery in time to avoid undue restriction.

In conclusion, the net results of the sardine investigations are that the present program is correct in the main but that more careful attention must be given to the statistics of catch and to the recording of method. It is going to be possible to foretell the catch, although detection of overfishing is shown to be further removed.

THE ALBACORE INVESTIGATION.

During the past two seasons observations have been made upon the albacore runs, as usual. The results from these have been filed away, but are now being subjected to analysis since the completion of the sardine work has allowed the concentration of the assistants upon the data. The report upon the albacore, which has been for some time in

the final stages, has not been completed for publication, and it is not, at present writing, known how soon the writer can resume work upon it. The material has collected faster than analysis can be made by the much-interrupted labors of a single investigator, the more so as at times he has lacked assistance of any kind. It is possible, however, to give a résumé of the results of the work, which are of very considerable interest, especially when compared to those of the sardine.

In common with all investigations carried on by the Fish and Game Commission, the primary purpose of the work is to watch carefully for evidences of depletion from overfishing. Of this there have to date been found no good evidences in the albacore fishery, despite the decline in catch. In view of this, the writer is not ready to recommend restrictive legislation which might aggravate a scarcity very probably due to the habits of the fish.

The great changes visible in the albacore catch and the distribution of the fishing grounds cannot well be assigned to overfishing on the basis of our present knowledge. The abrupt cessation in 1923 of the fishing in the more northerly of the frequented grounds is not at all characteristic of overfishing, if the history of other fisheries can be taken as any criterion. Nor is it consistent therewith that the fishing near San Diego should be unusually successful at the same time. Furthermore, the decline to the north has been a failure to take fish from what schools were present, whereas were overfishing and depletion the cause there should be every reason to expect occasional good catches from small schools. Unless these phenomena, upon investigation and analysis by means of our statistical records, prove to have other meanings than they apparently have, there is need for caution in coming to a conclusion.

Overfishing may nevertheless be taking place, despite this great variability. Developments in fishery science have served to indicate how complex the factors may be which govern the abundance of fish, and have rendered it questionable whether overfishing can always be distinguished from great natural fluctuations. It would therefore be advisable to conserve the species in so far as possible until our knowledge of basic principles of fishery science can be more clearly applied.

On the one hand, our work has indicated to us that the variability in the runs of albacore, just as in the runs of sardines, must delay recognition of overfishing and must throw increased emphasis upon the necessity for correct and thorough statistics of the catch. Our "pink ticket" system must become the foundation stone for our biological analysis.

But, on the other hand, the possibility of detecting overfishing is heightened by the relative lack of variability in the numerical strength of incoming age classes, since some clue may very probably be obtained to the length of life. Analysis is proceeding along this line. The task is a considerable one, but providing there is a lessening in the proportion of mature taken, accompanying a decline in the catch, as shown by our "pink tickets," it will be safe to attempt restriction of the fishery, we believe.

If this uniformity of incoming year classes continues in evidence despite closer analysis and the records of succeeding years, there will be no opportunity to foretell the catch by those methods so readily applied in the case of the sardine, because of the dominance of certain age groups and the suppression of others in that species.

In lieu of fluctuations in catch due to the presence of dominant or suppressed age groups, there have been found great changes due to the sensitiveness of the albacore to physical conditions. At the present stage of the work, this analysis has been carried only so far as to compare the different sections of the individual runs. It will, however, now be attempted to carry the analysis to a comparison of the annual changes with whatever oceanographical or climatological data are available. It is entirely possible that the albacore runs as a whole vary with, and that their magnitudes are the result of, conditions existing previous to the runs themselves. In such case the prophesying of the commercial catch may be possible. Such a case has been supposed to exist in regard to the mackerel off the British coasts, but the data upon which the reasoning was based seem to us very unsatisfactory and as they have never been followed up, we can place no dependence upon the relationship supposed to exist. It would appear that our knowledge of the albacore runs is so thorough that we can logically hope for far more satisfactory results than in that case, and it is the present intention to follow the work through.

It is the hope of the laboratory staff that it may at some time in the future be able to utilize a boat in following up this clue to the behavior of the albacore. This boat should make a daily traverse of a given region, taking careful scientific records, until a run occurred. Thereby it would be possible to definitely assign the runs of fish to the correct causes. As we have plotted the localities in which runs occur, it seems to us entirely feasible to accomplish this.

It may be pointed out that, as in the case of the sardine, there has been attained at least partially the first step in the understanding of the catch. The varying characteristics of the catch have been accurately recorded, and the actual variation brought to light as far as possible, both as regards the varying classes of fish taken, and as to the varying size of the catches. This, the first step in any scientific analysis of a natural phenomenon, is a secure basis upon which to base decisions.

However, in considering the detection of overfishing we have found that the presence of this great variability in catch has the same effect—in lesser degree perhaps—that it did upon the detection of overfishing in the case of the sardine, that is, to render it more difficult. A persistent decrease in proportion of mature fish and in average catch per boat must be brought to light, and must exceed so clearly the incidental variations as to be unmistakably significant. Not merely must there be known the proportion of each age in the samples obtained by this rigid system, but there must be carried forward a comparison of the average boat catch each year during the runs of the smaller or larger fish. The need for the "pink ticket" system is obvious and great. It can not be dispensed with lest we lose the most of our significant evidence.

The bearing upon theories of migration of the observed correlation between the albacore runs and the changes in climatological factors, deserves to be sharply emphasized. It has been possible to demonstrate this correlation to a sufficient extent so that it seems fairly certain that the minor intraseasonal so-called "runs" are not due to incoming schools but to schools which are already present. None of the evidence of migration has been found to bear critical examination. We must

conclude that whatever migration occurs is not responsible for the peculiarities of the fishery.

The great variations in locality of the season's catches are impossible of comparison with any of the great proved migrations, such as those of the salmons, the eel, or the birds, for in no one of those cases are the appearances abrupt and unrelated one to another, nor in any one case are the migrations omitted or partially aborted as was the run of albacore during 1923 in southern California. Furthermore, the appearance of the albacore in our waters is not preceded by its presence in any other waters.

It seems, therefore, plain to us that our albacore fishery consists of fish belonging to our own or offshore and deeper waters, and that these reappear each spring as soon, and no sooner, than they begin to take bait at the surface.

At present there seems to us to be two lines along which this phase of the albacore work, that of the study of movements, may be followed, in addition to the main one of correlating the catch with observed physical conditions. One of these lines is to carry out an intensive study aimed at the distinction of our albacore from that of any other region. This would be expensive work and would involve work in Hawaii or in foreign countries. The other would be an intensive search for the spawning places of the albacore. This, which would at least require very expensive sea-going vessels, and is not within our reach at present, would be little likely to succeed, since the discovery of a few eggs and young would be far from establishing the spawning place of the species.

The rate of growth of the albacore has been investigated as thoroughly as possible. The work upon this, which has been difficult because of the indistinctness of age marks upon the scales or bones, shows that the occasionally present youngest fish are 21½ inches long and just completing their second year; that the group of medium-sized fish, usually the smallest size taken, average about 27 inches in length and are finishing their third year; and that the larger fish, of 38 or 40 inches in length are in the eighth year or older.

PURSE SEINE INVESTIGATION.

Dr. Tage Skogsberg has completed his investigation of the purse seiners and has left the service of the Commission for employment at Berkeley.

His report is a very exhaustive treatment of the facts upon which regulation of that fishery must be based. He gives a description of the industry and its history, deals fully with the importance of the purse seine method to the fresh fish supply and to the canneries, and analyzes their effect upon the supply and price of fish. He then considers them in relation to the various species which they take, such as the barracuda, the white sea bass, the yellow tail, and the blue-fin tuna. His conclusions as to the possibilities and results of prohibitive or restrictive legislation are carefully considered, and he points out their great importance in the future development of our sea fisheries.

The fact that the purse seine fishery was enormously expanded in response to the wartime demand is well shown. Although the purse seiner *Alpha* operated as early as 1893, yet it was not until 1915 that expansion took place. In that year five boats were used. But each

year saw successful fishing and high prices, until in 1920 more than a hundred boats were operating. That such an enormous growth could be called forth on demand demonstrated that in case of war need great supplies of food can be drawn from our waters. But since then the demand has slackened, and certain of the fisheries not having been productive, there have been hard times in the purse seine fleet (at least until the time of completion of the report).

It is also clearly shown, that regardless of the nationality of the fishermen, the ownership of the fleet has come to rest in the hands of the banks and of moneyed men. The fishery is not, therefore, a process of "fattening" the "alien" at our expense.

The purse seiners are shown to be of the greatest importance to the several fisheries. Almost all the blue-fin tuna taken is brought in by purse seiners, and the canning of this species is dependent upon them. They also take a very large part of the yellow-fin tuna and the bonito used for canning. Of three species which are very important in the fresh fish market, namely the barracuda, white sea bass, and yellow tail, the supply during the winter half of the year is almost altogether obtained from the purse seiners. Although Dr. Skogsberg's analysis covered but six months of the year it is evident that the purse seine is responsible for nearly half the supply of fresh fish markets at Los Angeles harbor.

Examination of the individual fisheries shows no conclusive evidence of a harmful effect by the purse seiners. In the case of the barracuda the purse seiners are especially important as bringing fish from Mexico, thus lightening the demand upon our local fisheries, and acting as an aid in their conservation. The method is not more harmful than those of other great fisheries. Young fish are caught in excessive numbers in but a small portion of the year, a fault which could be readily corrected by a close season. In regard to the white sea bass, the same may be said as to the effect of the purse seiners in tapping distant grounds, and but few young bass are caught. Nor are there any evidences of overfishing in the cases of the yellow tail or blue-fin tuna. Dr. Skogsberg concludes that overfishing must be discovered by careful biologieal study of the catches, and that as long as a given supply is to be taken from the water, the purse seines are as efficient and reasonable a means of so doing as any.

It is evident from the report that any radical restriction of the purse seine fishery will result in rendering the supply of fresh fish precarious and inadequate, and that—instead of conserving our supplies—a much greater strain will be imposed on our local waters. Dr. Skogsberg recommends the making of a close season during April and May, as a protection to the young barracuda then taken in numbers.

Dr. Skogsberg's report is reviewed here at some length because it is indicative of the knowledge such work can place in the hands of the administrator and the legislator, and because it demonstrates the great value of our statistical system of boat catches, the "pink ticket" from which it was largely taken.

He had time only to analyze the catches for a period of six months and there should be a similar analysis of the remaining six. There is no reason why such an analysis of boat catches cannot be carried on continuously and presented in addition to the ordinary statistics of catch, for such an analysis may be made a step in the obtaining of the total

catch. But the essential necessity on the part of the compiler for a knowledge of the biology of the fish and for a knowledge of statistical methods is obvious from a perusal of Dr. Skogsberg's report. For that reason it is elsewhere urged that changes be made in our organization which will allow of the development of such a system of reports.

GRUNION INVESTIGATION.

Miss Frances N. Clark, who was with the laboratory during the first year of the last biennial period, is now at the University of Michigan seeking a higher degree. She is, while there, undertaking an investigation of the grunion and of our common market smelts. The laboratory has taken samples of these species at regular periods, and has forwarded them to her for analysis.

Her work has progressed through a study of the reproduction and rate of growth of the grunion, and has now begun on a study of the two smelts (*Atherinops* and *Atherinopsis*) from the same standpoints. The results of his work are promising to be of considerable importance, especially in the case of the grunion, which will sooner or later require protection, as it has become a very famous fish on our southern beaches, and is sought by thousands of people during the periods of its runs.

LOCAL RACES OF HERRING, SARDINE, AND ANCHOVY.

Mr. Carl L. Hubbs, of the Museum of Zoology, University of Michigan, has prepared for publication as a Fish Bulletin of this laboratory, a report upon the local races of the three commercially important clupeoid fishes found on our coasts, particularly as the definition of these local races is affected by seasonal variations. The importance of such investigations is very great, since through them has been expected some clue to the relative interdependence of fishes of different regions. The persistence of a given peculiarity of structure in the fish of a limited region argues that those fish do not migrate extensively beyond the boundaries of the region, and that they do not receive migrants. This would seem to be true regardless of the cause of peculiarity, and regardless of whether the peculiarity is racial, the result of environment, or transitory. The matter is, however, a complex one, and must receive intensive analysis, toward which Mr. Hubbs has made this contribution.

THE LIBRARY.

Since July, 1922, the library has received very few books. This is due in part to the necessity for economy, and in part to the prolonged absence of a librarian able to devote sufficient time to ordering and caring for accessions. However, enough recent publications have been secured, so that the laboratory investigators have had an opportunity to keep fairly familiar with the progress of fishery science.

The library as it now exists, although of moderate proportions, contains a good representation of the most important work in the subjects of interest to the research men stationed here. It has of course been the aim of those in charge of selecting books to emphasize such material as has fundamental significance and definite relation to the problems with which the Commission has to deal, keeping at a minimum papers of purely local, incidental or general biologic interest.

The lines of future library development are clear. As in the past, it will be important to spend a certain percentage of the appropriation for current books, especially in view of the fact that fisheries research is now the object of increasing international interest and attention. A set of "Biometrika," which is the chief journal of statistical method, would be an invaluable addition to our resources. However, the main mode of expansion must be acquisition of desired papers that are scattered in various scientific periodicals. Whenever possible, we will order only the issues which contain the special investigations of interest, so as to avoid purchase of large volumes in which most of the material would be useless.

Aside from addition of books, provision for permanent preservation of the collection now shelved becomes more and more necessary. Three-fourths of the material here is in the form of paper-covered pamphlets, which are of course exposed to dust and other deteriorating influences. Their adequate protection requires that they be bound as soon as possible.

As far as its immediate usefulness is concerned, the library's chief need is for a systematic catalog. Enlargement of the staff and growth of the library combine to make us acutely conscious of the waste of time consequent upon trying to use unindexed material. We therefore consider it essential to build up a catalog that will make available for ready reference the perhaps unrealized resources of the books already at hand.

CONCLUSION.

In this report, three facts are preeminently worthy of consideration. One is the necessity for retaining good men as guides for our student assistants; another is the need for giving the scientific work a more stable position and a better relationship to the work of other agencies; and the third is the great emphasis which our work is now throwing upon the necessity for carefully fostering our statistical system. As far as concerns the first two facts, the retention of good men and the permanence of the program are closely bound together. Good men do not work for the money immediately in sight. They must feel themselves engaged in work which has its place in the world, a place that is recognized as worthy.

Much of the fishery work which has been carried on in the United States has been transitory and unstable in aim, and the fundamental principles of fisheries conservation have received very little attention because of the evanescent nature of each attempt. We have tried to so formulate our work that it includes those things which are fundamentally necessary, and we are trusting that our devotion to a cause will not be wasted by the heedlessness of the future. There is, however, little ground at present for this faith in the persistence of the work, and as a result it is hard to persuade anyone that earnest, unselfish work will be worth while, or that the program will last long enough to solve any of the basic problems of fishery research and conservation.

In short, the organization of which the laboratory now forms a part exists only in the minds of those who now hold office in and under the Commission. With the passing of these incumbents there will vanish all traces of the carefully thought out permanent program. None of the objectives have been made obligatory, and no provision has been made for seeing that our successors are well informed or well advised. Under

such conditions good men can not be retained, and the following of fundamental and difficult aims is rendered hopeless. The remedy lies plainly at hand, to formally organize the scientific work, to formally provide for good advice and cooperation from the outside world of science, and to see that our aims are rendered obligatory in so far as is proper and in such a way as to protect them from ignorance or malice.

The whole of modern fisheries science teaches the lesson that adequate statistics are continuous statistics; that conservation implies continuous observation; and that some of the most fundamental problems are yet unsolved and must be the object of unremitting attack by biologists. And unless our work here can be placed on a permanent basis and provision made for its close, intimate contact with the whole field of work, there is little utility in proceeding further.

The writer would therefore recommend a legal foundation for the formal organization of the laboratory, the formation of a cooperative arrangement with the Federal Bureau of Fisheries, and the creation of an advisory committee or board to keep a general supervision of the scientific work. The time is most opportune for these things, in that the bureau is friendly, and that the various states are awakening to the need of the study of conservation. By our action we can set a precedent whereby the bureau can be made a unifying and correlating agency between the several states, to the end that cumbrous and awkward treaty control can be avoided.

The writer would also urge that the work done up to the present has demonstrated the importance of the statistical system, and its intimate connection with the biological work. He would recommend the careful reorganization of the statistical system to free it from any danger of its devotion to erroneous ends, and to place it under the immediate direction of a scientifically trained man.

Respectfully submitted.

W. F. Thompson,
In charge.

REPORT OF DEPARTMENT OF EDUCATION, PUBLICITY AND RESEARCH.

The Honorable Board of Fish and Game Commissioners,
State of California, Sacramento, Cal.

Sirs: It is with a feeling of gratification that I hand you herewith a report on the activities and accomplishments of the Department of Education, Publicity and Research, which you will find, reviews the most successful biennial period, so far as service to the public is concerned, since the establishment of the department in 1914. I am more than ever convinced that no more fundamental conservation work can be done than that accomplished through the development of a public sentiment favorable to wild life conservation.

The past biennial period has been marked by increasing demand for lectures and displays of motion pictures. Some of the increased demand has come from the numerous men's clubs such as Rotary, Lions and Kiwanis. Continued endeavor has been made to reach the numerous

high schools of the state, as is evidenced by the record which shows that more than thirty were visited during the period. Return engagements are a common thing, showing that lectures and pictures are appreciated. One long-postponed trip to southern California resulted in a series of nineteen lectures and a total attendance of 9275. The demand for lectures continued from fish and game protective associations.

A particularly fruitful field of endeavor has been the numerous training classes for scout masters, camp fire guardians and leaders of girl scouts. Eight meetings with such groups have resulted in stimulating the interest of those who deal with boys and girls. Conservation needs can most readily be spread by contact with such groups as these.

Each spring, a series of nine lectures on fish and game have been given in a course in forestry at the University of California. These lectures afford a splendid opportunity for inspiring a student group that later goes out and carries the message of conservation into the field of forestry and industry.

The usual series of illustrated lectures have been given at the State Fair at Sacramento each September.

The following is a summary of the lectures given:

Lectures Given During Biennial Period, July 1, 1922, June 30, 1924.

Organization	Number of lectures	Attendance
High schools	31	10,223
Grammar schools	17	8,109
Universities and colleges	23	3,215
Civic and public	34	7,053
Boy scouts, camp fire girls, etc.	12	447
State Fair	26	3,250
Miscellaneous	17	1,481
Motion picture films only	9	4,309
Totals	168	38,069

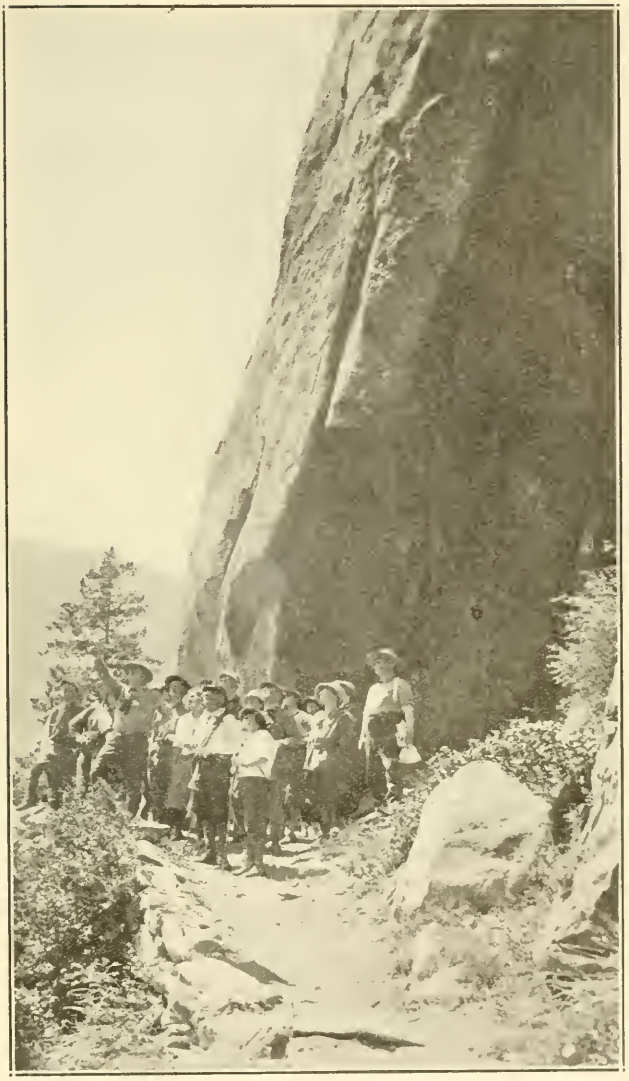


FIG. 16. Studying nature first-hand. Nature guide field excursion, Yosemite Valley, Summer, 1924. Photograph by J. Lloyd.

SUMMER RESORT EDUCATIONAL WORK.

Through cooperation with the National Park Service, opportunity has been given each summer to build up public sentiment relative to conservation in Yosemite National Park. The director of your Department of Education and Publicity spent the summer of 1922 and that of 1923 in Yosemite lecturing and conducting field trips. The results have been most gratifying. Many thousands of people have heard conservation lectures and, better yet, have gained first-hand information relative to

game and nongame species. Personal contact with thousands and the teaching of natural history in the open is laying a worth-while foundation upon which the conservation of the future can be built. If "there is no more pitable sight than ignorance in action," then the converse is certainly true, that there is nothing more effective than intelligence in action. Let the people of this state really know the life history and habits of its fauna and its present status, and conservation will be assured.

It is a satisfaction to chronicle the fact that the nature guide work in Yosemite has proved so useful that the original goal—a museum and a park naturalist in every national park and a nature guide program every season—is now assured. No little share in the success of the nature guide movement is to be attributed to the farsightedness of the California Fish and Game Commission in supporting the work in its beginnings.

With an increased personnel, the same program of evening lectures and campfire talks, daily field trips and office hours has been pursued each summer with greatly increased attendance, as can be seen by reference to the following tables:

Attendance Record Yosemite Nature Guide Service.

	Field trips		Lectures	
	Number	Attendance	Number	Attendance
July-August, 1922	99	1,970	43	27,100
June-August, 1923	226	3,566	69	49,195
May-June, 1924	72	939	85	16,202
	397	6,475	197	92,497

MOTION PICTURES.

The Educational Department has not been in a position to push the use of motion pictures by schools and other organizations because of the small supply of films on hand and because several of the films are badly worn. The only additions made in the past two years were a reel devoted to the life history and habits of the king salmon and several hundred feet on waterfowl in the Sacramento Valley made by ourselves. Particular mention should be made of a fine series of pictures of whistling swans taken in the rice fields of Butte County. A flock of a thousand birds was photographed in a rice field and splendid pictures of the birds in flight were secured on Butte Creek.

The need is for a more adequate library of films so that opportunity can be taken of the many requests for their use. Replacement of worn films is particularly urgent.

Nor does the demand come from within the state only, for during the past two years, requests have come from four western states and Hawaii for the use of our films. It was necessary to refuse these requests in that the pictures are so constantly used in our own state.

During the past biennial period there has been increased demand also for conservation literature on the part of teachers and pupils of the public schools. Evidently the public schools are placing more emphasis upon nature study and conservation and herein lies the reason for increased demand. The Commission's supply of teachers' bulletins is practically exhausted and hundreds of letters are written a year explaining that the supply of the bulletin, "Bird Study in the Public

FIG. 17. The place to teach conservation is out-of-doors. Cooperative work in Yosemite is building a better sentiment favoring conservation. Photograph by J. Lloyd.

Schools" is entirely exhausted. Where can the commission's educational campaign be made more effective than in the schools of the state? Were we in a position to furnish suitable helps to teachers, much could be accomplished. Stress is here laid upon the urgent necessity of supplying this great need in the immediate future. In the same connection should be mentioned the opportunity afforded through boy scout organizations. If leaflets or bulletins, suitable for use by scouts, were available, suitable training relative to the conservation of wild life would be included in the educational program of each scout troop. A special fund to cover the preparation and publication of such leaflets and bulletins is most important.

The department again cooperated with the State Department of Education in the preparation of a bird and Arbor Day manual. A great deal of material was furnished but funds not being available for the publication of the manual, part of the material was utilized in a special number of the "Western Journal of Education."

As in the past, many contributions of specimens of birds and eggs were made to schools and nature study departments. This department of the Commission aims to act as a clearing house for information relative to the teaching of nature study and conservation and also as a source of material for objective teaching.

PUBLICATIONS.

Volume 8 of California Fish and Game, the quarterly magazine of the Commission, contained 256 pages and 87 illustrations. Two special numbers, a Game Refuge number containing maps of every game refuge in the state and a description of each, and a Hatchery number of 80 pages containing a history of fish-cultural operations in California were issued. Volume 9 contained 192 pages and 41 illustrations. No special numbers were included.

The edition of the magazine is now 7000 and the circulation very close to 6500. Many applications from individuals and libraries for early numbers of the periodical in order to complete sets have been received. Unfortunately many early numbers are now so rare as to preclude issuance to any but public libraries or libraries of public or important institutions. There is continued evidence that the magazine is read from cover to cover and numerous commendatory letters have been received.

A clean-up of the mailing list in the fall of 1922 resulted in the elimination of only about 200 names. The mailing list grows at the rate of about twenty names per month.

One use which the magazine appears to fill regularly is that in the classroom in our high schools where it is constantly used for reference by biology classes. Articles taken from the quarterly often appear in outdoor magazines and in newspapers.

Numerous newspaper items have been sent to the more prominent newspapers of the state. These appeared to be well received by editors and nearly always appeared in print. Among the special series of articles should be mentioned a number dealing with books for sportsmen furnished the sporting editor of the San Francisco "Examiner," a short series of items dealing with the restoration of Lower Klamath Lake as a breeding ground and a long series of one item a week relative to saving the Klamath River as a fish reserve sent newspapers during the spring and summer of 1924. Material for several feature articles was furnished.

INVESTIGATIONS.

Several investigations of importance have been made. They include the destruction of steelhead trout in the Pajaro River due to pollution and low water, investigation of the status of game birds in the marshes of Butte and Sutter counties, fish resources of the Klamath River, and an investigation of the relation of birds and mammals to the foot-and-mouth disease. The latter was occasioned by the continued attempt to place the blame for the spread of the disease upon wild birds and mammals. In the case of the Merced outbreak, ducks and sea gulls were accused. Although many migratory ducks were found on infected areas, yet the disease failed to develop along the line of flight and no positive evidence could be found. Certain control measures involving buzzards were advocated near Merced.

An epidemic among predatory animals in El Dorado County during the spring of 1924 was found to be the result of rabies, as was shown by a positive test made on a California gray fox.

The department continues to compile data on the annual deer kill, on hunting accidents and on the work of the scientific collector.

Respectfully submitted.

HAROLD C. BRYANT,
In charge Education, Publicity and Research.

SACRAMENTO DISTRICT REPORT.

The Honorable Board of Fish and Game Commissioners of the State of California.

GENTLEMEN: Moving of the board office to Sacramento occasioned considerable reorganization and expansion of the office force. Practically all of the general routine work of the Commission is now handled through this office.

Deputies in this division, like those in other parts of the state, have greater areas to patrol than those in most other states. Complaints as to law enforcement come largely from those who do not realize the impossibility of being at every place where a violation occurs when one man has to cover two counties. A larger patrol force is greatly needed.

FIG. 18. Ineffective screening of an irrigation ditch was responsible for this loss of fish life in Butte County. More than 2100 sunfish are shown in the picture. Photograph by A. E. Culver.

During the biennial period ending June 30, 1924, this division has had to deal with many difficult conservation problems. Chief among them, involving this division, has been the problem presented by a cement power ditch on the American River which menaced the lives of hundreds of deer passing between their winter and summer ranges. It took considerable experimentation to figure out means of getting the deer safely across the canal. The power company cooperated splendidly in rescuing deer and immediately began the construction of a fence which will prevent recurrence another year.

One serious problem in this division is found in the numerous projects where streams are wholly diverted from their channels for power purposes. Seldom is proper consideration given the fish thus destroyed. We sincerely trust that companies concerned will not divert all the waters in the streams but will permit sufficient water to flow in the main channels to insure the maintenance of trout life. The South Fork of the American River is one of the best trout streams of the state that is available to the large centers of population. It is useless to plant nearly a million trout in this stream and its tributaries if the water in its channel is allowed to be diverted.

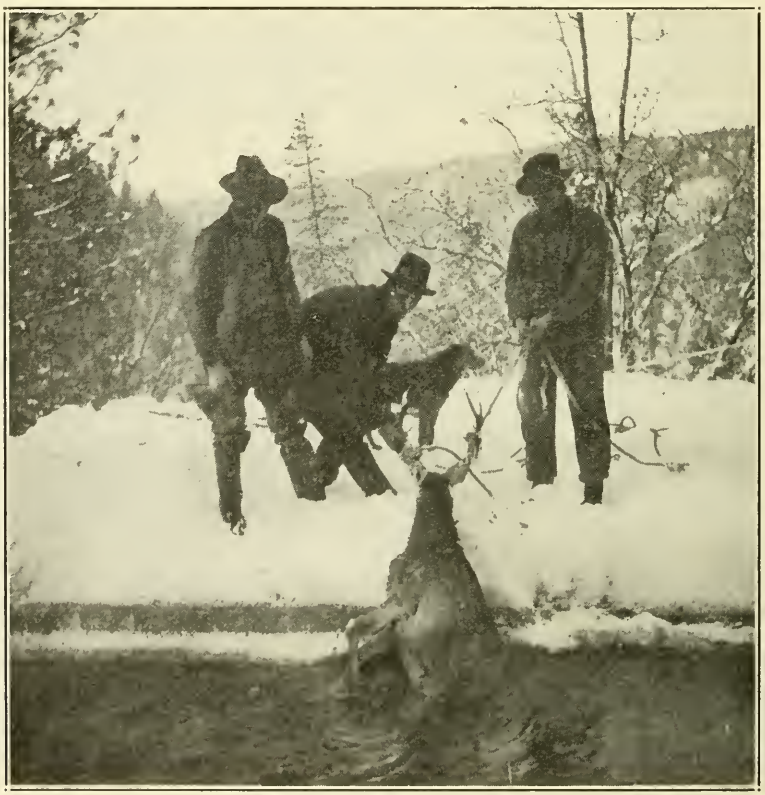


FIG. 19. Rescuing deer from a power ditch on the American River. Until provision was made for safe crossing of migrating deer many were drowned or frozen and hundreds had to be rescued. Photograph by Euell Gray.

Since much of the best shooting ground for waterfowl, as well as the best deer country, is found within this district, the enforcement of law occupies an important place in our duties. Conservation sentiment in this district continues to expand, as is shown by the percentage of convictions for violations and the increase in the number of fines inflicted. California deputies each patrol a greater area of square miles than do the deputies of any other state. The force, moreover, is inadequate as compared with conditions in other states. Residents and visitors are now beginning to realize what a great asset fish and game are to the community. In years past few arrests were made and it was almost impossible to secure a conviction by jury even in the face of strong and conclusive evidence. How different today! The Commission now fearlessly submits the equity of the game laws to a judge or jury. Due to the steadily-growing belief of our best citizens that the fish and game laws are of equal value with other laws on our statute books, the Commission and its officers receive the hearty cooperation of the county prosecutors and justices.

A glance at the comparative chart on page 12 will show the tremendous burden placed upon our law enforcement deputies. The land area of California comprises 153,650 square miles and has less than eighty deputies to patrol its land and water areas and enforce its fish and game laws, besides it has nearly 1200 miles of coast line. Each California deputy's share of patrol is over 1387 miles, 810 acres of land, and more than 360 acres of freshwater streams and about 11,810 acres of lakes. New York state with but 46,070 square miles has 143 more salaried deputies than has California. The New England states with the addition of New York, Ohio and Delaware comprise less area than California, but have 436 wardens. These states expend $794,028, as compared with California's expenditure of $102,169 for warden service. Yet there are some who are prone to criticise the Commission for not detecting every violation of the fish and game laws.

Respectfully submitted.

GEORGE NEALE,
In charge.

SAN FRANCISCO DISTRICT REPORT.

The Honorable Board of Fish and Game Commissioners,
State of California.

GENTLEMEN: The past two years have noted few changes in game conditions in the San Francisco District. The biennial period, however, has been a severe one for trout on account of the fact that the rainfall throughout the state was practically half normal and in many places even less than that. Streams that have never failed in previous years have been without water. Very few of the coast streams carried enough water to clear the bars at the mouths, with the result that few steelhead were able to make their way into the lagoons, and even when they did the water was so low they could not reach the spawning grounds.

In certain streams fishing was excellent at the opening of the season the first of May. One of these, the Gualala, in Sonoma County, had

FIG. 20. A scene on the Klamath River above the Copco dam. Photograph by J. O. Snyder.

particularly good fishing during the entire month of May. The river was closed and the fish that were in the lagoon could not make their way into the ocean. One Sunday there were 135 limits taken, the fish measuring from 8 to 10 inches in length. Many limits were taken in less than an hour's time. There were so many fish in the lagoon that by the first of June the fish caught were very poor, there being insufficient feed in the stream to take care of them.

The dry season will have a very serious effect on the trout streams of the district. To bring conditions back to normal will require heavy stocking on the part of the Commission. It is hoped that with the return of normal rainfall the ocean steelhead will return and assist in stocking the coast rivers. The shortage of rain, however, is not entirely without some benefit. Predatory fish, such as suckers and hardheads, have been cleared out of many trout streams, and if the contention of many fishermen is true that these species prey largely on trout, newly planted trout will have nothing to do but to grow fat for the anglers.

Duck shooting during the biennium was excellent everywhere except in the San Joaquin Valley, where water conditions were not normal. In the Suisun marsh, the season of 1923-24 was as good as the most enthusiastic duck hunter could desire.

The Fish and Game Commission is severely criticized for not entirely stopping the sale of ducks. Few hunters realize how great a task it is to control a matter of this sort. There are bootleggers in ducks as well as other things, we will admit, but as a matter of fact the number of ducks sold in San Francisco now does not equal five per cent of those sold before the nonsale law was adopted. In San Francisco in the old days there were sold every season from three to five hundred thousand ducks. There were game transfer companies in operation, with the permission of the courts, that handled thousands of birds

each day. All of this has been stopped. The comparatively few birds that are now sold are smuggled into San Francisco by automobile and are peddled to those who are willing to take a chance. Restaurants and hotels are searched repeatedly and seldom do the deputies find in excess of the bag limit. The sale of ducks in the field is even more difficult to control. Market hunters will continue to sell birds to unlucky hunters. Such sales are between man and man and it is practically impossible to secure evidence that would warrant the taking of anyone into court.

Contrary to many reports, quail have not materially decreased during the past two years. More or less quail shooting can be had in every county of the state. Recently a well informed hunter from San Benito County was in the San Francisco office discussing conditions in that county. His estimate as to the number of quail in San Benito County was not less than 100,000 and not more than 200,000 birds. Fortunately, quail are good breeders. The average clutch of eggs is better than 15. With 100,000 birds or 50,000 pairs as breeding stock, and 15 eggs per pair, in that county alone we have a potential flock of 750,000 quail for the hunters to harvest. Even if only one-tenth of this number of young birds reach maturity, it must be admitted that San Benito County is well supplied with quail. Valley quail can adapt themselves to civilization better than almost any other game bird. You need not go farther than Golden Gate Park or any other similar park in our state to have this fact proved. Quail, as years go by, are becoming more and more educated as to the ways of the hunter and it is largely for this reason that complaints are received that quail are decreasing. In most sections of the state, as soon as a shot is fired, the quail take to the high brush where it is practically impossible for hunters to do any shooting.

The annual kill of deer in California is between 15,000 and 20,000. Deer hunting has increased largely on account of the ease with which the deer country can be reached by automobile. One of the most serious crimes that we have to contend with is the killing of deer at night by spotlight. Night hunters do not care whether they kill buck, doe or fawn, for they realize that it is extremely difficult to catch them. A deputy must be at the right spot at the right time, otherwise it is practically useless to go into court. We know of no law that can be drafted that will make it easier to control this illegal work. The present law is as strong as any law could be made. The only way that the work can be stopped is to put more men into the field.

The respect that people in general have for the laws on our statutes is proportionate to the ability of the government of the state to enforce these laws. Without proper enforcement any law will soon become obsolete and will be broken by otherwise high class citizens. The enforcement of the game laws is similar to the enforcement of all other laws, easier than some, perhaps, for game law violations are committed for the most part by those who fish and hunt or whose business brings them into direct contact with the law and not by citizens as a whole. Our California laws, with very few exceptions, are as good or better than the fish and game laws in other states. The laws are reasonable and are not opposed by those who take conservation seriously. There is, however, a considerable class who hunt and fish who are meat hunters and not sportsmen. Such men care nothing for

tomorrow. If they had the opportunity, they would kill the last quail, duck, or deer and then brag about it for the remainder of their lives. Such men cannot be reached by appealing to their finer sensibilities but must be educated through the courts. This education can only be accomplished by having men in the field to enforce the laws, who are trustworthy in every particular, who have the backing of the judges, and the assistance of all good sportsmen. Day by day the sentiment for the enforcement of the game laws is getting better and better. Heavier fines are imposed and more and more violators are convicted, but the best results can only be obtained by having a greater number of active game wardens working at all hours of the day and night. It is unreasonable to expect one man to keep an area of many hundreds of square miles free from violations. Those who hunt are increasing year by year and make no complaint regarding the payment of a dollar for a license. If the number of hunters increase, so should the number of wardens increase. The more seriously the laws are enforced, the more seriously will violations be considered. The penalty for violating a game law can be made as high as the conscience of the justice of the peace before whom the violator is taken, will allow. Fines as high as $500 may be imposed and in addition a jail sentence may be given. In counties where heavy fines are imposed, there is a decided improvement in conditions. In other counties where the minimum fine is the rule, violations are more frequent. Many individuals are willing to take a chance on killing game during the closed season if when taken to court they will only have to pay $25; but if there was a probability of their having to pay somewhere near $500, they would not take a chance.

The work of the deputies in the San Francisco District has, for the most part, been entirely satisfactory. The general public has no conception of the long hours that a serious deputy puts in. It is not everyone who can make good in law enforcement work. It requires a peculiar training and fitness to make good as a game warden. The most discouraging thing that can happen to a deputy is to take a good case before a justice of the peace and have the defendants liberated or made to pay a petty fine.

More wardens, better cooperation of the judges, and the active assistance of sportsmen will assure game in California for years to come.

During the last two years fines totalling $32,995 were imposed in the San Francisco District. Judge Ray Griffin of Redwood City imposed fines amounting to $3,455 in his court. Other judges in various parts of the district did almost as well. One deputy working in San Mateo arrested defendants who were assessed a total of $4,215. Another deputy in Santa Cruz County had fines to his credit in the amount of $3,675. A third deputy in Marin County had $3,025 to his credit. Fines of $100 were not unusual. Some of the most noteworthy cases by deputies working in this district were as follows:

August 13, 1922, Judge Griffin of Redwood City fined Felix Doer and John Perasso $250 each for killing a doe; December 10, 1922, Judge Whipple of Fort Bragg sent Amador Mecidas to jail for 180 days for using a set net; March 11, 1923, Judge Griffin fined P. S. Bogani $200 for having illegal abalones in possession; April 9, 1923, Judge Wallace

of Salinas fined T. Kohanhoni, a second offender, $150 for the possession of illegal Pismo clams; May 17, 1923, Judge Evans of Loleto fined Fred Simmons $150 for killing a deer during the closed season; July 30, 1923, Judge Griffin fined Joe Trupiano $200 for possession of illegal abalones; August 14, 1923, Judge Boyd of Plantation fined R. F. Webb and D. S. Cloughn $100 each for killing a fawn; September 2, 1923, Judge Snow of Napa fined Manuel Lopez and Tony Alvorez $100 each for killing a fawn; October 21, 1923, Judge Johnson of Daly City fined four Italians $450 for taking 133 song birds in an Italian bird net; April 25, 1924, Judge Jacks of San Francisco fined Paladini Fish Company $250 for having small striped bass in possession; May 25, 1924, Judge McGuinness of Dunsmuir fined the same fish company $500 for shipping small bass to Portland; June 19, 1924, Judge Rudolph of Novato fined John Alberti $300 for killing illegal deer.

Respectfully submitted.

J. S. Hunter,
In charge.

LOS ANGELES DISTRICT REPORT.

The Honorable Board of Fish and Game Commissioners of the State of California.

Gentlemen: Geographically comprising but the lower third of California, this southern division, during the biennial period ending June 30, 1924, has had to deal with the most spectacular population growth ever experieneed anywhere over an equal area, bringing upon us an even greater than proportional gain in outdoor sporting enthusiasm.

Inevitably, this enormously has increased our responsibilities, far beyond capacity of the dollar-unit of license income adequately to finance meeting such demands by the general expansion in every department thereby indicated as necessary.

That these primary outdoor-attraction assets have assumed a new and greater importance in their ever more valuable relation to the general public welfare, scarcely needs suggestion excepting to the ever-shrinking minority which sees in fish and game pursuit only a pastime of our large leisure classes, and with more wilful perversity, persists in ignoring the enormous material, physical and psychological worth of wild-life to the entire commonwealth of California.

Our guiding principle during these troublous times steadfastly has remained the greatest general good, not only to the sporting classes most directly interested in conserving fish and game attraction-assets through their loyal and liberal support of our work with their hunting and angling licenses, but also to the non-sporting public. Through upkeep of these outdoor resources, so alluring to sportsmen of other older Eastern states where conservation has been less forehanded than here, our wild-life has called countless thousands of well-to-do men this side the Sierras to invest themselves, their families and their lifetime accumulations in the material up-building of this state. Yet, the nonsporting citizenry of California in this matter still continues enjoying the unique role of better than incidental beneficiary without

cost. The licenses of his sport-loving friends at an all-too-moderate dollar annual privilege-tax, have paid for everything the commonwealth has done in behalf of rod and gun attractions until today licensed hunters and anglers stand more than ever ready to double the dollar and do the job to the limits of what more money could accomplish.

FIG. 21. Klamath River Steelhead trout. Photograph by George Neale.

Conservation of fish and game, being carried on entirely by popular support of a minority, is dependent upon a favorable public sentiment for its financing to an even greater degree than any other self-supporting activity undertaken under state direction. The history of wild-life work in America is a chronicle of activities primarily initiated by sportsmen in behalf of sportsmen and paid for by sportsmen; since under no other system of general appropriation from tax funds has anything of lasting consequence ever been accomplished.

Over fifteen years ago. California's leading sportsmen, with commendable foresight, saw this great truth, and shot to center with the Hunting License Act, followed in due course with a similar tax upon which has grown, all too gradually, the considerable superstructure of an organization which up to date at least has accomplished the demonstration that money in large amounts intelligently invested toward the protection and propagation of fish and game, can long delay its extermination and the extinction of its allied industries, if not also perpetuate it. That, the future alone can determine; but present policy is being shaped to mould the conservation program along the indicated lines of civilization, and thus adapt it to the now assured destiny of southern California—intensive development.

In face of these facts, the importance of broad popular education to the economic as well as sentimental value of fish and game hardly could be ignored; so the last two years have seen no slackening in such activities throughout southern division work. Our veteran field patrolmen have consistently joined therein at every opportunity; liberal advertisement has been given of law-enforcement activities to the end that the law-abiding majority might know how much is being done to protect their interests against the careless or selfish who respect only the consequences of violation. That long years of patient effort seem at last to have borne some fruit in fostering popular support for earnest wild-life effort, is one of the gratifying demonstrations of the past biennium which offsets many a disappointment.

Transportation of sport-seekers and their housing has stimulated a huge expenditure in itself, being an enormous and duly-recognized contributor to the automotive industry, now conceded to be among the biggest businesses of the country. Perhaps a better idea of the financial importance of our outdoor assets may be derived from learning that this year the lower third of this state will license not far from a fifth of a million sport-seekers, each of whom, on a conservative estimate, will put into general circulation through the exercise of this dollar privilege, at least another hundred dollars in transportation, guns, ammunition, fishing-tackle, camping goods, general equipment; patronage of resorts and more beyond mention, totaling perhaps 20 million dollars.

Growing interest of other organizations than the Fish and Game Commission in wild-life, is another outstanding feature of the past biennium, due no doubt in considerable degree to desire of helping temporarily over a recognized emergency, of which expense an expected increase in sporting license will relieve the various now cooperating counties another year. Such cooperation, where genuine and non-competitive, nor losing sight of legitimate objectives, has been warmly welcomed as adding materially to the enforcement of law. Eventually the Fish and Game Commission expects in southern California to relieve these county cooperating agencies of any expense in fish and game conservation, just as the Supreme Court already has relieved the counties of any responsibility in fish and game regulation by consistently deciding that such regulation of hunting and fishing remains the special province and prerogative of the biennial legislatures, thereby lending at least some stability to these restrictions and allowing the sporting public as well as industries allied thereto, the opportunity to

learn what regulations were to govern them until the next legislative session, at least.

Suffice it to say that the ever-increasing needs of southern California these last two years have been met as far as we were able, and not as we would have met them; but rather, as our controlling limitations required.

Prosecution of petty offenders against the technicalities of the hunting and fishing restrictions is of course a necessary part of the day's work in wild-life conservation and must go on, lest the voluntary support of the vast majority in observing the laws they believe in, be prejudiced by seeing too large a proportion of persistent violators escaping the punishment they deserve. For this purpose, an elaborate and expensive patrol organization must be maintained. To the violating class, such constitutes the outstanding activity of the sportsmen's Fish and Game Commission; but to the vast majority who support the law consistently because they know that without restriction, fish and game speedily would become but a bad memory, real conservation represents bringing all the people to appreciation of what it actually means.

The fostering and encouragement of sporting resorts open and accessible to all the people has played a prominent part in southern division activities during the past two years, it also being truly constructive conservation of a particularly important nature in view of the self-supporting nature of all wild-life work in California. Herein also, the general public has proved a very direct party-at-interest, since whatever contributes to the outdoor attractiveness of the state can not fail to benefit every business in it, not to mention the inestimable advantages of facilitating healthful outdoor recreation.

As one result of such work, we see a steadily-swelling increase in number of hunting and fishing resorts where the average sportsman of moderate means may enjoy himself at reasonable cost. There is a very common tendency amongst promoters to found their propositions upon the quite generally exploded theory of exclusiveness, forgetting that volume of business is the surest prospect of lasting profit. The enormous success of our largest resorts has been built upon a broad policy of serving all comers, since the millionaire class naturally is in the minority.

Respectfully submitted.

E. L. Hedderly,

In charge.

APPENDIX

FISH DISTRIBUTION BY COUNTIES, SEASON 1922.

Mount Shasta Hatchery.

County	Rainbow	Loch Leven	Eastern brook	Large lake	German brown	Salmon
Alameda	76,000				10,000	
Alpine	60,000	135,000	60,000		52,500	
Amador	30,000		125,000		50,000	
Butte	216,000	120,000	53,000			
Calaveras	120,000	425,000	48,000		258,000	
Colusa	40,000	30,000				
Del Norte	50,000		60,000	100,000		
El Dorado	227,000	389,300	195,000		192,000	
Fresno	350,000	590,000	170,000		139,000	
Glenn	17,000	15,000				
Humboldt	200,000		10,000			
Kern		158,000	50,000		50,000	
Lake	60,000					
Lassen	15,000	10,000				
Madera	160,000	90,000	50,000			
Marin	75,000	75,000				
Mariposa	85,000	130,000	56,000		65,000	
Modoc	143,000	33,000	47,500			
Monterey	227,000	180,000			25,000	
Napa	55,000	100,000				
Nevada	403,000	723,500	160,000		50,000	
Placer	202,500	277,500	191,500		6,000	
Plumas	138,000	119,000	84,500			
San Benito	50,000	72,000	5,000		22,000	
San Luis Obispo	80,000	42,500	8,000			
San Mateo	95,000		2,000			
Santa Barbara	67,500	22,500	10,000			
Shasta	338,500	388,000	10,000		50,000	
Sierra	20,000	35,000	20,000			
Siskiyou	193,000	284,500	197,500		108,000	12,311,000
Sonoma	65,000	4,000				
Tehama	89,500	62,500	50,000			
Trinity	85,000	28,000	57,000			
Tulare	20,000	150,000	25,000		20,000	
Tuolumne	385,000	630,000	145,000		205,000	
Totals	4,438,000	5,319,300	1,890,000	100,000	1,302,500	12,311,000

FISH DISTRIBUTION BY COUNTIES, SEASON 1922—Continued.

Fall Creek Hatchery.

County	Rainbow	Salmon
Siskiyou	495,000	3,331,000

Mount Whitney Hatchery.

County	Rainbow	Loch Leven	Steelhead	Eastern brook
Fresno	16,000			
Inyo	89,000	95,000	98,000	40,000
Kern	210,000	40,000		30,000
Los Angeles	195,000	10,000	70,000	
Mariposa	44,500	17,500	55,500	17,500
Mono	222,000		15,000	10,000
Orange	52,500	25,000	35,000	
Riverside	70,000	15,000	15,000	
Santa Barbara	8,000		80,000	
San Bernardino	11,000		5,000	
San Diego	110,000		145,000	
Tulare	246,000	85,000	60,000	20,000
Ventura	187,500	15,000	157,500	
Totals	1,461,500	302,500	736,000	117,500

Fort Seward Hatchery.

County	Rainbow	Steelhead	Large lake	Black spotted	Cutthroat	Salmon
Humboldt	294,280	425,000	71,690	146,090	99,690	1,997,430

Ukiah Hatchery.

County	Rainbow	Steelhead
Humboldt	194,500	50,000
Mendocino	182,000	325,000
Santa Cruz	6,000	
Sonoma	55,000	150,000
Totals	437,500	525,000

Tahoe Hatchery.

County	Rainbow	Steelhead	Black spotted	Large lake
Alpine				75,000
El Dorado	400,000	60,000	50,000	
Nevada	10,000			45,000
Placer	565,000	40,000	405,000	
Sacramento			25,000	
Sierra				25,000
Totals	975,000	100,000	480,000	145,000

Tallac Hatchery.

County	Large lake	Black spotted
El Dorado	270,000	190,000

FISH DISTRIBUTION BY COUNTIES, SEASON 1922—Concluded.

Domingo Springs Hatchery.

County—	Rainbow
Plumas	437,300
Tehama	75,000
Total	512,300

Clear Creek Hatchery.

County—	Rainbow
Lassen	400,000
Plumas	25,000
Total	425,000

Snow Mountain Station.

County—	Steelhead
Mendocino	109,000

Bear Lake Hatchery.

County—	Rainbow
San Bernardino	1,290,100

North Creek Station.

County—	Rainbow
San Bernardino	750,000

Brookdale Hatchery.

County—	Steelhead
San Mateo	30,000
Santa Clara	251,000
Santa Cruz	578,000
Total	859,000

Feather River Hatchery.

County	Rainbow	Steelhead
Butte	10,000	
Plumas	348,000	132,000
Sierra	30,000	100,000
Yuba	102,500	15,000
Totals	490,500	247,000

Wawona Hatchery.

County	Rainbow	Steelhead
Mariposa	298,900	140,300

Kaweah Hatchery.

County	Rainbow	Steelhead
Tulare	295,000	140,000

FISH DISTRIBUTION BY COUNTIES, SEASON 1923.

Mount Shasta Hatchery.

County	Rainbow	Loch Leven	Steelhead	Eastern brook	Large lake	German brown	Salmon	Mackinaw
Alameda	20,000		5,000					
Alpine	75,000	144,000	10,000	38,000				
Amador	60,000	86,000	50,000	100,000		50,000		
Butte	187,000	135,000	40,000	38,500				
Calaveras	145,000	245,000	130,000	92,000		155,000		
Colusa	70,000	50,000	60,000	35,000				
Del Norte	40,000			70,000	90,000		40,000	
E Dorado	194,000	398 500	70,000	238,500		182,500		
Fresno	336,000	230,000	135,000	177,000		87,000		
Glenn	40,000	50,000		20,000				
Kern	150,000			80,000				
Lake						50,000		60,000
Lassen	10,000	10,000		10,000				20,000
Madera	79,000	85,000	30,000	60,000				
Marin	25,000	50,000	25,000					
Mariposa	120,000	68,000	50,000	120,000		110,000		
Mendocino						50,000		
Modoc	71,000	80,000	9,000	50,500				
Monterey	352,500	71,000	35,000					
Mono	15,000	50,000	10,000	20,000				
Napa	10,000		10,000					
Nevada	415,000	677,000	132,500	359,000		115,000		
Placer	177,000	232,500	35,000	294,000		12,500		
Plumas	168,000	145,000	90,000	148,500				
San Benito	27,500	44,000	20,000			40,000		
San Luis Obispo	100,000	114,000	50,000	8,000				
San Mateo	50,000		45,000	10,000				
Santa Barbara	40,000	26,000	20,000	10,000				
Santa Clara			10,000	10,000				
Santa Cruz	10,000		20,000	32,000				
Shasta	287,500	188,000	65,000	47,500		50,000		
Sierra	15,000	25,000	7,500	37,500				
Siskiyou	154,000	580,050	58,000	305,050		50	12,089,000	
Solano		100,000	50,000					
Sonoma	35,000	4,000						
Tehama	87 000	110,000	115,000	22,000				
Trinity	70,000	50,000	50,000	60,000				
Tulare	30,000	220,000	30,000	74,000				
Tuolumne	355,000	552,000	315,000	323,000		350,000		
Yolo						10,000		
Totals	4,020,500	4,820,050	1,782,000	2,890,050	90,000	1,262,050	12,129,000	80,000

Fall Creek Hatchery.

County	Rainbow	Salmon
Siskiyou	305,000	3,550,000

Mount Whitney Hatchery.

County	Rainbow	Loch Leven	Steelhead	Eastern brook
Fresno	10,000			
Inyo	216,000	171,000	318,000	110,000
Kern			280,000	
Los Angeles	130,000	35,000	113,000	
Madera			50,000	
Mono	221,000	51,000	523,000	54,000
Orange	8,000	15,000	10,000	
Riverside	79,000	35,000	79,000	5,000
San Diego	52,500	12,500	225,000	
San Luis Obispo			20,000	
Tulare	90,000	100,000	110,000	40,000
Ventura	90,000	15,000	130,000	
Totals	896,500	434,500	1,858,000	209,000

FISH FISTRIBUTION BY COUNTIES, SEASON 1923—Continued.

Fort Soward Hatchery.

County	Rainbow	Steelhead	Cutthroat	Salmon	Large lake
Humboldt	432,560	1,480,000	156,260	2,177,120	98,260
Mendocino	190,000	435,000			
Siskiyou	20,000				
Trinity	25,000	25,000			
Totals	667,560	1,940,000	156,260	2,177,120	98,260

Ukiah Hatchery.

County	Rainbow	Steelhead
Lake	20,000	230,000
Mendocino	80,000	315,000
Napa		85,000
Sonoma	99,000	186,000
Totals	199,000	816,000

Snow Mountain Station.

County—	Steelhead
Mendocino	50,000

Tahoe Hatchery.

County	Steelhead	Large lake
El Dorado	120,000	160,000
Nevada		30,000
Placer	285,000	575,000
Sierra	40,000	25,000
Totals	445,000	790,000

Tallac Hatchery.

County	Steelhead	Large lake
Alpine		60,000
El Dorado	805,000	495,000
Totals	805,000	555,000

Domingo Springs Hatchery.

County—	Rainbow
Lassen	22,000
Plumas	451,640
Shasta	12,000
Totals	485,640

Clear Creek Hatchery.

County—	Rainbow
Lassen	350,000
Plumas	126,905
Total	476,905

FISH DISTRIBUTION BY COUNTIES, SEASON 1923—Concluded.

Bear Lake Hatchery.

County	Rainbow	Steelhead
San Bernardino	1,101,000	80,000

North Creek Station.

County—	Rainbow
San Bernardino	600,000

Wawona Hatchery.

County	Rainbow	Steelhead
Mariposa	199,300	249,000

Kaweah Hatchery.

County	Rainbow	Steelhead
Tulare	195,000	245,000

Brookdale Hatchery.

County—	Steelhead
Santa Clara	300,000
Santa Cruz	550,000
Totals	850,000

Feather River Hatchery.

County	Rainbow	Steelhead
Butte		13,000
Plumas	228,880	347,000
Sierra	98,000	190,000
Yuba	60,000	60,000
Totals	386,880	610,000

SUMMARY OF FISH DISTRIBUTION, SEASON 1922-1923.

Hatchery	Rainbow	Loch Leven	Steelhead	Eastern brook	German brown
Bear Lake	2,391,100		80,000		
Brookdale			1,709,000		
Clear Creek	901,905				
Domingo Springs	997,940				
Fall Creek	800,000				
Feather River	877,380		857,000		
Fort Seward	961,840		2,365,000		
Kaweah	490,000		385,000		
Mount Shasta	8,458,500	10,139,350	1,782,000	4,780,050	2,564,550
Mount Tallac			805,000		
Mount Whitney	2,358,000	737,000	2,594,000	326,500	
North Creek	1,350,000				
Snow Mountain			159,000		
Tahoe	975,000		545,000		
Ukiah	636,500		1,341,000		
Wawona	498,200		389,300		
Totals	21,696,365	10,876,350	13,011,300	5,106,550	2,564,550

SUMMARY OF FISH DISTRIBUTION, SEASON 1922-1923—Concluded.

Hatchery	Large Lake	Cutthroat	Black spotted	Mackinaw	Salmon
Bear Lake					
Brookdale					
Clear Creek					
Domingo Springs					
Fall Creek					6,881,000
Feather River					
Fort Seward	169,950	255,950	146,090		4,174,550
Kaweah					
Mount Shasta	190,000			80,000	24,440,000
Mount Tallac	825,000		190,000		
Mount Whitney					
North Creek					
Snow Mountain					
Tahoe	935,000		480,000		
Ukiah					
Wawona					
Totals	2,119,950	255,950	816,090	80,000	35,495,550

RECAPITULATION, SEASON 1922-1923.

Trout	56,527,105
*Salmon	35,495,550
Grand total	92,022,655

*There were 4,041,000 salmon hatched from eggs collected at the Klamathon station during the past winter and spring that will not appear in the statistical report until the next biennial report of the Commission. There would have been a great many more salmon eggs taken had not the racks been washed out by the floods.

LICENSE SALES.

HUNTING LICENSE SALES, YEAR 1922-1923.

Counties	Total sales	Citizen	Non-resident	Alien	Declarant alien
Alameda	$11,802	$11,347	$30	$225	$200
Alpine	116	56	60		
Amador	887	862		25	
Butte	4,548	4,503		25	20
Calaveras	1,123	1,123			
Colusa	2,368	2,303	10	25	30
Contra Costa	3,115	2,920		175	20
Del Norte	745	665	80		
El Dorado	1,726	1,631	70	25	
Fresno	11,100	10,845	10	175	70
Glenn	1,777	1,707	50		20
Humboldt	5,113	4,803	10	150	150
Imperial	1,400	1,400			
Inyo	1,291	1,281	10		
Kern	7,064	6,934		50	80
Kings	1,853	1,843			10
Lake	1,147	1,407	20		20
Lassen	2,029	1,869	140		20
Los Angeles	41,928	41,223	100	475	130
Madera	1,580	1,460	10	50	60
Marin	2,046	2,016			30
Mariposa	284	284			
Mendocino	3,725	3,460		75	190
Merced	2,702	2,537		125	40
Modoc	2,710	1,425	1,260	25	
Mono	307	147	160		
Monterey	3,062	2,947		75	40
Napa	2,695	2,375		50	270
Nevada	1,229	1,094	80	25	30
Orange	4,383	4,373			10
Placer	2,722	2,382	60	100	180
Plumas	1,322	1,252	50		20
Riverside	2,986	2,966	10		10
Sacramento	6,752	6,067	210	275	200
San Benito	1,130	1,030	10		90
San Bernardino	4,823	4,778	20	25	
San Diego	8,267	8,177	10	50	30
San Francisco	18,453	14,993	30	1,300	2,130
San Joaquin	6,551	6,291		100	160
San Luis Obispo	2,682	2,602		50	30
San Mateo	1,842	1,707		25	110
Santa Barbara	3,518	3,448	20		50
Santa Clara	6,759	6,474		75	210
Santa Cruz	3,256	3,011		25	220
Shasta	2,563	2,458	10	25	70
Sierra	209	209			
Siskiyou	5,075	3,960	640	125	350
Solano	2,949	2,864		25	60
Sonoma	7,786	7,096		450	240
Stanislaus	3,998	3,878		50	70
Sutter	833	823			10
Tehama	1,960	1,940	20		
Trinity	981	961			20
Tulare	6,128	5,918	10		200
Tuolumne	1,945	1,865	10		70
Ventura	2,906	2,906			
Yolo	2,379	2,249	10	50	70
Yuba	2,129	2,119			10
Reno, Nevada	90		90		
Total sales	$239,149	$225,264	$3,310	$4,525	$6,050
Total number of licenses	226,381	225,264	331	181	605

Citizen, $1; non-resident, $10; declarant alien, $10; alien, $25.

HUNTING LICENSE SALES, YEAR 1923-1924.

Counties	Total sales	Citizen	Non-resident	Alien	Declarant alien
Alameda	$13,140	$12,635	$30	$175	$300
Alpine	128	78	50		
Amador	849	814	10	25	
Butte	5,239	5,114		75	50
Calaveras	1,038	1,038			
Colusa	2,414	2,384	10		20
Contra Costa	3,273	3,188		25	60
Del Norte	966	781	150	25	10
El Dorado	1,657	1,572	50	25	10
Fresno	10,469	10,339	10	50	70
Glenn	1,849	1,759	90		
Humboldt	5,435	5,000	20	225	190
Imperial	1,138	1,088		50	
Inyo	1,377	1,377			
Kern	6,737	6,587	10	50	90
Kings	1,674	1,664			10
Lake	1,498	1,488			10
Lassen	2,082	2,022	30		30
Los Angeles	54,047	53,252	130	425	240
Madera	1,469	1,394		25	50
Marin	1,950	1,930			20
Mariposa	281	281			
Mendocino	3,805	3,665			140
Merced	2,639	2,549		50	40
Modoc	4,226	1,566	2,640		20
Mono	255	165	90		
Monterey	3,914	3,789		75	50
Napa	2,715	2,385	30	50	250
Nevada	1,215	1,120	30	25	40
Orange	5,199	5,189			10
Placer	2,813	2,493	10	100	210
Plumas	1,456	1,426	10		20
Riverside	3,867	3,817	10		10
Sacramento	9,174	8,164	250	400	360
San Benito	1,224	1,144			80
San Bernardino	5,133	5,068		75	10
San Diego	8,725	8,640	40	25	20
San Francisco	19,370	15,375	110	1,425	2,460
San Joaquin	6,314	6,069		75	170
San Luis Obispo	2,891	2,731	10	100	50
San Mateo	1,956	1,721		75	160
Santa Barbara	3,690	3,485	30	75	100
Santa Clara	7,007	6,712		125	170
Santa Cruz	2,320	1,970		50	300
Shasta	2,591	2,466	30	25	70
Sierra	268	258			10
Siskiyou	5,272	4,257	430	175	410
Solano	2,049	2,999		50	
Sonoma	7,802	7,307	10	125	360
Stanislaus	4,099	3,969	20	50	60
Sutter	887	887			
Tehama	1,671	1,651	10		10
Trinity	968	923		25	20
Tulare	5,868	5,743		125	
Tuolumne	1,959	1,874	10	25	50
Ventura	3,044	3,034	10		
Yolo	2,412	2,262	10	50	90
Yuba	2,318	2,298			20
Total sales	$260,846	$244,986	$4,380	$4,550	$6,930
Total number of licenses	246,299	244,986	438	182	693

Citizen, $1; non-resident, $10; declarant alien, $10; alien, $25.

ANGLING LICENSE SALES, YEAR 1922.

(Sporting Fishing).

Counties	Total sales	Citizen	Non-resident	Alien
Alameda	$9,192	$8,895	$6	$291
Alpine	389	134	240	15
Amador	763	757		6
Butte	3,907	3,817	9	81
Calaveras	964	964		
Colusa	656	641		15
Contra Costa	1,522	1,498		24
Del Norte	558	540	18	
El Dorado	2,098	1,963	51	84
Fresno	10,765	10,222	21	522
Glenn	633	606		27
Humboldt	5,128	4,927	18	183
Imperial	371	371		
Inyo	2,778	2,661	66	51
Kern	3,008	2,963	9	36
Kings	1,145	1,088		57
Lake	578	569	3	6
Lassen	1,550	1,436	51	63
Los Angeles	31,734	31,077	162	495
Madera	1,203	1,170		33
Marin	1,011	1,011		
Mariposa	315	315		
Mendocino	2,416	2,371		45
Merced	1,216	1,204	6	6
Modoc	884	866	18	
Mono	782	383	333	66
Monterey	1,790	1,775	3	12
Napa	1,679	1,661	3	15
Nevada	2,014	1,807	81	126
Orange	2,213	2,201	6	6
Placer	2,456	2,267	99	90
Plumas	2,036	1,895	48	93
Riverside	1,818	1,755	12	51
Sacramento	8,534	6,755	141	1,638
San Benito	403	400		3
San Bernardino	6,407	6,380	9	18
San Diego	3,893	3,866	6	21
San Francisco	16,136	14,816	270	1,050
San Joaquin	5,519	5,102		417
San Luis Obispo	1,716	1,686	6	24
San Mateo	775	772		3
Santa Barbara	2,915	2,897	9	9
Santa Clara	5,296	5,248	3	45
Santa Cruz	2,774	2,696		78
Shasta	2,647	2,563	18	66
Sierra	559	523	12	24
Siskiyou	4,705	4,258	264	183
Solano	2,296	2,170		126
Sonoma	4,846	4,726	12	108
Stanislaus	3,395	3,374	6	15
Sutter	348	333		15
Tehama	1,348	1,342	3	3
Trinity	617	608		9
Tulare	5,863	5,704	15	144
Tuolumne	2,153	2,042	18	93
Ventura	2,892	2,805	3	84
Yolo	772	745	3	24
Yuba	1,311	1,266	6	39
Reno, Nevada	990		990	
Yosemite Valley	1,056	918	138	
Total sales	$189,738	$179,805	$3,195	$6,738
Total number of licenses	183,116	179,805	1,065	2,246

Citizen, $1; non-resident, $3; alien, $3.

ANGLING LICENSE SALES, YEAR 1923.

(Sporting Fishing).

Counties	Total sales	Citizen	Non-resident	Alien
Alameda	$11,849	$11,510	$18	$321
Alpine	524	119	402	3
Amador	791	785	----------	6
Butte	4,572	4,449	21	102
Calaveras	982	470	3	9
Colusa	855	810	----------	45
Contra Costa	2,064	1,980	----------	84
Del Norte	627	582	36	9
El Dorado	2,360	2,222	63	75
Fresno	13,440	12,735	12	693
Glenn	730	724	----------	6
Humboldt	6,191	5,957	12	222
Imperial	334	334	----------	----------
Inyo	3,618	3,528	42	48
Kern	3,396	3,354	24	18
Kings	1,401	1,293	9	99
Lake	841	832	3	6
Lassen	1,939	1,837	27	75
Los Angeles	37,640	36,995	159	486
Madera	1,479	1,437	3	39
Marin	1,217	1,214	----------	3
Mariposa	147	144	----------	3
Mendocino	3,057	2,988	45	24
Merced	1,717	1,669	----------	48
Modoc	989	920	63	6
Mono	836	464	282	90
Monterey	2,632	2,563	12	57
Napa	2,069	2,021	6	42
Nevada	2,338	2,179	60	99
Orange	3,822	3,798	9	15
Placer	2,852	2,603	81	168
Plumas	2,529	2,364	45	120
Riverside	2,282	2,222	6	54
Sacramento	10,901	8,993	33	1,875
San Benito	483	477	----------	6
San Bernardino	8,642	8,558	21	63
San Diego	4,956	4,923	12	21
San Francisco	18,234	16,950	60	1,224
San Joaquin	7,770	7,266	----------	504
San Luis Obispo	1,932	1,896	3	33
San Mateo	1,107	1,095	----------	12
Santa Barbara	3,594	3,561	15	18
Santa Clara	6,303	6,258	3	42
Santa Cruz	3,243	3,129	6	108
Shasta	3,063	2,952	48	63
Sierra	715	676	21	18
Siskiyou	5,856	5,181	450	222
Solano	2,417	2,249	----------	168
Sonoma	5,873	5,780	12	81
Stanislaus	4,892	4,808	9	75
Sutter	614	602	----------	12
Tehama	1,635	1,611	15	9
Trinity	750	729	9	12
Tulare	6,633	6,477	9	147
Tuolumne	2,335	2,254	6	75
Ventura	3,370	3,343	3	21
Yol-	904	886	----------	18
Yuba	1,768	1,702	9	57
Reno, Nevada	1,434	----------	1,434	----------
Yosemite Valley	1,451	1,298	147	6
Total sales	$232,995	$221,259	$3,768	$7,968
Total number of licenses	225,171	221,259	1,256	2,656

Citizen, $1; non-resident, $3; alien, $3.

MARKET FISHERMEN'S LICENSE SALES.

Total sales, license year April 1, 1922, to March 31, 1923	$44,720 00
Total sales, license year April 1, 1923, to March 31, 1924	41,230 00

License fee: $10 to all persons.

TRAPPING LICENSE SALES.

Total sales, license year July 1, 1922, to June 30, 1923	$3,136 00
Total sales, license year July 1, 1923, to June 30, 1924	2,597 00

License fee: Citizens, $1; aliens, $2.

FISH PACKERS' AND WHOLESALE SHELL-FISH DEALERS' LICENSE SALES.

Total sales, license year July 1, 1922, to June 30, 1923	$1,170 00
Total sales, license year July 1, 1923, to June 30, 1924	1,240 00

License fee: Citizens, $5; aliens, $20.

GAME BREEDERS' LICENSE SALES.

Total sales, license year January 1, 1922, to December 31, 1922	$92 50
Total sales, license year January 1, 1923, to December 31, 1923	170 00

License fee: All persons, $2.50.

FISH BREEDERS' LICENSE SALES.

Total sales, license year January 1, 1922, to December 31, 1922	$45 00
Total sales, license year January 1, 1923, to December 31, 1923	50 00

License fee: All persons, $5.

DOMESTICATED FISH IMPORTERS' LICENSE SALES.

Total sales, license year January 1, 1922, to December 31, 1922	$5 00
Total sales, license year January 1, 1923, to December 31, 1923	5 00

KELP LICENSE SALES.

Total sales, year 1922	$10 00
Total sales, year 1923	None

License for term of one year from date of issue. Fee, $10.

VIOLATIONS OF THE FISH AND GAME LAWS.

GAME CASES.

	July 1, 1922, to June 30, 1923			July 1, 1923, to June 30, 1924		
	Number of arrests	Amount of fines and forfeitures imposed	Jail sentences imposed (days)	Number of arrests	Amount of fines and forfeitures imposed	Jail sentences imposed (days)
Violations, Hunting License Act	93	$1,483 50	50	130	$2,040 00	180
Deer—buy or sell; taking and possession, run with dogs, closed season; failure to retain horns and hide; over bag limit	93	3,310 00	100	125	5,493 00	695
Deer—taking and possession does, fawns, spike bucks	51	3,055 00	270	53	5,175 00	------
Ducks—buy or sell; taking and possession closed season, over bag limit	52	2,060 00	30	61	2,815 00	240
Geese—taking and possession closed season, over bag limit	6	150 00	------	9	175 00	------
Mudhens—taking and possession closed season	1	25 00	------	4	45 00	------
Swans—taking and possession				2	50 00	------
Shorebirds—taking and possession	21	465 00	65	30	825 00	180
Doves—taking and possession closed season, over bag limit	24	665 00	------	36	880 00	------
Quail—taking and possession closed season, over bag limit	32	1,117 50	------	51	1,425 00	190
Pheasants—taking, possession	4	250 00	------	14	635 00	------
Non-game birds—taking and possession	38	990 00	------	42	1,360 00	------
Trespass	19	195 00	------	22	470 00	------
Shoot wild game from automobile, power or sail boat; animal blind; illegal use of scull boat	8	220 00	30	31	885 00	60
Night hunting	34	1,000 00	------	107	2,650 00	------
Game refuge—hunting and possession of firearms	14	290 00	------	22	375 00	------
Sage hens—taking, possession, closed season, over bag limit	3	225 00	------	------	------	------
Rabbits—cottontail, brush; taking and possession closed season	19	435 00	90	18	500 00	------
Grouse—taking and possession closed season	2	25 00	------	------	------	------
Pigeons, wild—taking and possession (no open season)	21	895 00	------	2	50 00	------
Squirrels, tree—taking and possession (no open season)	1	25 00	------	3	100 00	------
Mountain sheep—taking and possession (no open season)	1	250 00	------	1	100 00	------
Violations—fur trapping regulations	5	80 00	------	4	70 00	------
Miscellaneous cases	6	140 00	------	3	75 00	------
Total game cases	518	$17,351 00	635	770	$26,223 00	1,545

FISH CASES.

	July 1, 1922 to June 30, 1923			July 1, 1923 to June 30, 1924		
	Number of arrests	Amount of fines and forfeitures imposed	Jail sentences imposed (days)	Number of arrests	Amount of fines and forfeitures imposed	Jail sentences imposed (days)
Violations of Angling License Act	72	$1,545 00	95	65	$1,415 00	200
Violations of Commercial Fishing License Act	44	565 00		47	580 00	
Trout—taking and possession closed season, other than hook and line, over bag limit	128	3,122 50		77	2,836 00	20
Black bass—taking and possession closed season, over bag limit, undersized	17	400 00		15	950 00	
Sunfish, perch, crappie—taking and possession closed season	14	280 00		2	20 00	
Night fishing, illegal	8	195 00		28	595 00	
Fishing—within ½ mile of hatchery; within 250 feet of fishway; off dams	16	470 00		16	225 00	360
Striped bass—sale: closed season; undersized; excess bag limit	47	925 00	195	59	2,035 00	180
Salmon—sale: closed season; over bag limit; illegal spearing	5	200 00	50	16	550 00	1,800
Crabs—taking and possession closed season; undersized	20	440 00		32	665 00	
Clams—taking and possession closed season, over bag limit; undersized	96	3,485 00	210	117	3,940 00	120
Lobsters—taking and possession closed season; over bag limit; undersized	28	880 00	240	41	1,885 00	
Abalones—taking and possession closed season; over bag limit; undersized	85	2,385 00		146	4,990 00	90
Catfish—sale: undersized	2	50 00		1	20 00	
Halibut—undersized	3	75 00				
Barracuda—undersized	10	450 00		8	240 00	
Sturgeon—possession	2	50 00				
Nets, traps, lines—illegal use or possession	44	2,950 00	183	26	1,965 00	100
Obstructions in streams; failure to maintain fish screen				7	150 00	
Water pollution, use of explosive to take fish	4	200 00	120	7	800 00	150
Failure to keep commercial fishing data; destruction of food fishes	3	120 00		1		
Illegal shipment—fish; shell fish	2	25 00	30	6	275 00	
Miscellaneous cases	4	100 00		26	1,155 00	
Total fish cases	654	$18,912 50	1,123	743	$25,291 00	3,020

CASES JULY 1, 1922, TO JUNE 30, 1923.

	July, Aug., Sept.	Oct., Nov., Dec.	Jan., Feb., Mar.	Apr., May, June	Total
Convictions	247	247	208	258	960
Bail forfeited	18	28	2	16	64
Suspended sentences	22	34	18	24	98
Pending	9		2		11
Acquittals	3			1	4
Dismissals	6	7	9	9	31
Juvenile cases	3	7	13	11	34
Totals	308	323	252	319	1,202

CASES JULY 1, 1923, TO JUNE 30, 1924.

	July, Aug., Sept.	Oct., Nov., Dec.	Jan., Feb., Mar.	Apr., May, June	Total
Convictions	302	424	323	235	1,284
Bail forfeited	27	10	9	7	53
Suspended sentences	25	26	16	34	101
Pending	3	3	5	1	12
Acquittals	7	5	5	1	18
Dismissals	4	16	6	2	28
Juvenile cases	5	6	6		17
Totals	373	490	370	280	1,513

RECAPITULATION.

	Number of arrests	Fines and forfeitures imposed	Jail sentences (days)
Fish cases, 1922-1923	654	$18,912 50	1,123
Game cases, 1922-1923	548	17,351 00	635
Totals, 1922-1923	1,202	$36,263 50	1,758
Fish cases, 1923-1924	743	$25,291 00	3,020
Game cases, 1923-1924	770	26,223 00	1,545
Totals, 1923-1924	1,513	$51,514 00	4,565
Recapitulation—			
1922-1923	1,202	$36,263 50	1,758
1923-1924	1,513	51,514 00	4,565
Totals	2,715	$87,777 50	6,323

TOTAL ARRESTS FOR A PERIOD OF TWENTY-TWO YEARS.

1902-1904	550
1904-1906	774
1906-1908	1,192
1908-1910	1,771
1910-1912	2,063
1912-1914	1,993
1914-1916	2,087
1916-1918	1,797
1918-1920	1,891
1920-1922	2,258
1922-1924	2,715

SEIZURES OF FISH, GAME AND ILLEGALLY USED FISHING APPARATUS.

	July 1, 1922 to June 30, 1923	July 1, 1923 to June 30, 1924	Total
Ducks	3,896	3,290	7,186
Geese	65	20	85
Shorebirds	43	36	79
Doves	68	143	211
Quail	77	16	93
Pheasants	3	7	10
Deer meat	1,258 pounds	2,091 pounds	3,319 pounds
Deer hides	5	3	8
Sage hens	27		27
Rabbits (cottontail-brush)	26	16	42
Wild pigeons	13	2	15
Non-game birds	36	267	303
Squirrels		2	2
Grouse	3		3
Bear meat		40 pounds	40 pounds
Mountain sheep heads	2		2
Birdnets		9	9
Trout	2,857 pounds	1,075 pounds	3,932 pounds
Black bass	146 pounds	38 pounds	184 pounds
Crappie, sunfish, perch	52	10	62
Salmon	3,002 pounds	5,664 pounds	8,666 pounds
Striped bass	2,123 pounds	1,420 pounds	3,543 pounds
Halibut	1,050 pounds	650 pounds	1,700 pounds
Barracuda	12,906 pounds	11,888 pounds	24,194 pounds
Spotfin croaker		400 pounds	400 pounds
Sturgeon	254 pounds	140 pounds	394 pounds
Catfish	177 pounds	97 pounds	274 pounds
Hardheads	31	7	38
Whitebait	40 pounds		40 pounds
Crabs	4,501	11,362	15,863
Clams	4,112	8,431	12,543
Lobsters	5,011 pounds	1,750 pounds	6,761 pounds
Abalones	711	1,652	2,363
Mussels	260		260
Shrimps	170 pounds		170 pounds
Smelts		19 pounds	19 pounds
Illegally used fishing apparatus, nets, traps	57	72	129

Illegally used fishing apparatus, after condemnation in superior courts, is destroyed or sold by the board in accordance with the law. All wholesome fish and game is donated to public and charitable institutions, from whom many grateful letters of acknowledgment have been received.

CALIFORNIA FISHERY PRODUCTS.

CANNED, CURED AND MANUFACTURED FISHERY PRODUCTS OF CALIFORNIA FOR THE YEAR 1922.

(Compiled by the Department of Commercial Fisheries, Fish and Game Commission of California.)

Canned.

Species of fish	Size of cans	Northern California district, cases	Monterey district, cases	San Pedro district, cases	San Diego district, cases	Total cases
Abalone	1-lb.		2,037	1,014		3,051
Albacore	1-lb.			20,570	4,315	24,885
	½-lb.			134,249	18,089	152,338
	¼-lb.			11,677	4,865	16,542
Bonita	½-lb.			5,208	160	5,368
	¼-lb.			5,223		5,223
Fish cake (Kamaboko)	1-lb.			8,222		8,222
	½-lb.			11,789		11,789
Mackerel	1-lb.			205		205
Salmon	1-lb. flat	4,162				4,162
	½-lb. flat	15,338				15,338
Sardines	1-lb. oval		353,188	340,860	3,595	697,643
	½-lb. oval		1,479	5,760		7,239
	½-lb. square			336	2,559	2,895
	¼-lb. square				20,986	20,986
	1-lb. tall			78		78
Shad	1-lb.	240				240
Shad roe	½-lb.	220				220
Squid	½-lb.				137	137
Striped tuna	1-lb.			2,977	9,011	11,988
	½-lb.			63,012	45,939	108,951
	¼-lb.			8,210	21,211	29,421
Tuna, bluefin	1-lb.			873	2,512	3,385
	½-lb.			7,827	13,727	21,554
	¼-lb.			2,275	7,455	9,730
Tuna, yellowfin	1-lb.				3,711	3,711
	½-lb.			1,002	14,400	15,402
	¼-lb.				5,823	5,823
Tuna, unclassified	4-lb.			635		635
	1-lb.			31,153		31,153
	½-lb.			127,919	5,000	132,919
	¼-lb.			78,419	400	78,819
Yellowtail	1-lb.			315		315
	½-lb.			3,336	23	3,359
Totals		19,960	356,704	873,144	183,918	1,433,726

Salted, Smoked and Dried.

Species of fish	Size or quantity	Northern California district	Monterey Bay district	San Pedro district	San Diego district	Total
Anchovy (salted)	Tierces		8			8
Barracuda (dried)	Pounds				5,000	5,000
Black cod (smoked)	Pounds	98,760				98,760
Bonita (smoked)	Pounds			24,000		24,000
Mackerel (dry salted)	Barrels			98		98
Mixed fish (dried)	Pounds				172,000	172,000
Salachini	10-lb. tubs		3,000			3,000
	50-lb. tubs		200			200
	50-lb. boxes		8,000			8,000
Salmon (mild cured)	Casks	1,571	104			1,675
(hard salted)	Barrels	163				163
(smoked)	Pounds	1,086				1,086
Sardines (dried)	Pounds				600	600
(dry salted)	50-lb. boxes		3,000			3,000
(dry salted)	Barrels			425		425
(dry salted)	Pounds			211,700		211,700
(smoked)	Pounds			12,800		12,800
Shad (mild cured)	Tierces	28				28
Sea bass (dried)	Pounds				11,000	11,000
Yellowtail (dried)	Pounds				55,000	55,000
(salted)	Barrels			50		50
(salted)	Pounds			32,730		32,730
Miscellaneous Data.						
Fish meal	Tons	396	2,299	5,373	959	9,027
Oil	Gallons	14,743	281,115	244,310	6,882	547,050
Estimated value of pack		$497,374	$1,974,591	$5,742,591	$1,318,202	$9,532,758
Number of employees		400	1,253	2,362	812	4,827
Value of packing plants		$1,396,400	$1,553,500	$5,101,846	$1,070,200	$9,121,946

NOTE.—Some Albacore included in Tuna, unclassified. Tierces—800 pounds net. Barrels—200 pounds net.

CANNED, CURED AND MANUFACTURED FISHERY PRODUCTS OF CALIFORNIA FOR THE YEAR 1923.

(Compiled by the Department of Commercial Fisheries, Fish and Game Commission of California).

Canned.

Species of fish	Size of cans	Northern California district, cases	Monterey district, cases	San Pedro district, cases	San Diego district, cases	Total cases
Abalone	1-lb.		2,237	662		2,899
Albacore	1-lb.			18,173	10,919	29,092
	½-lb.			173,206	67,953	241,159
	¼-lb.			18,122	9,142	27,264
Bonita	1-lb.			397		397
	½-lb.			13,763	69	13,832
	¼-lb.			458		458
Fish cake (Kamaboko)	½-lb.			28,283		28,283
Mackerel	1-lb.		271			271
Mackerel, filet	1-lb. oval			3,783		3,783
	½-lb. oval			3		3
Salmon	1-lb. flat	6,629				6,629
	½-lb. flat	12,385				12,385
Sardines	1-lb. oval		580,464	488,885	19,215	1,088,564
	1-lb. tall		520			520
	½-lb. oval		7,603	103	1,311	9,017
	½-lb. square		473		1,621	2,094
	¼-lb. square		1,925	2,085	26,058	30,068
Sardines, kippered	1-lb. oval			1,179		1,179
	½-lb. oval			581		581
Squid	½-lb.		1,759			1,759
Striped tuna	1-lb.			4,197	4,645	8,842
	½-lb.			105,781	50,637	156,418
	¼-lb.			25,824	8,144	33,968
Tonno	½-lb.			571	201	772
	¼-lb.			72	405	477
Tuna, bluefin	1-lb.			1,548	2,697	5,245
	½-lb.			27,698	19,373	47,071
	¼-lb.			2,630	99	2,729
Tuna, yellowfin	5-lb.			1,924		1,924
	1-lb.			7,246	3,903	11,149
	½-lb.			91,070	58,482	149,552
	¼-lb.			8,644	1,977	10,621
Tuna, unclassified	4-lb.			1,061		1,061
	1-lb.			1,948	965	2,913
	½-lb.			20,405	7,525	27,930
	¼-lb.			10,539	1,299	11,838
Tuna flake	1-lb.			1,029		1,029
	½-lb.				237	237
	¼-lb.				300	300
Yellowtail	1-lb.			1,425	937	2,362
	½-lb.			1,489	3,863	5,352
Totals		19,014	595,252	1,064,784	301,977	1,981,027

CANNED, CURED AND MANUFACTURED FISHERY PRODUCTS OF CALIFORNIA FOR THE YEAR 1923—Continued.

Salted, Smoked and Dried.

Species of fish	Size or quantity	Northern California district	Monterey Bay district	San Pedro district	San Diego district	Total
Barracuda (salted)	Pounds				42,264	42,264
Bonita (salted)	Pounds			5,384	1,415	6,799
(smoked)	Pounds			10,000		10,000
Mackerel (salted)	200-lb. barrel			390		390
	Pounds				6,889	6,889
Mullet (salted)	Pounds				1,075	1,075
Rock bass (salted)	Pounds				335	335
Rock cod (salted)	Pounds				1,730	1,730
Sablefish (smoked)	Pounds	9,461				9,461
Salacchini	50-lb. tubs		600	571		1,171
	50-lb. boxes		28,000			28,000
	21-lb. tins—					
	4 to case		450			450
	10-lb. boxes		6,000			6,000
Salmon (mild cured)	Tierces	1,320	91			1,411
(smoked)	Pounds	151,400				151,400
Sardines (mild cured)	Pounds			16,000		16,000
(hard salted)	Barrels			200	24	224
(hard salted)	Pounds			320,451		320,451
Sea bass, black (salted)	Pounds				8,557	8,557
Sea bass, white (salted)	Pounds				2,957	2,957
Sea trout (salted)	Pounds				1,740	1,740
Shad (mild cured)	Tierces	116				116
Squid (dried)	Pounds		99,000			99,000
Yellowtail (salted)	Pounds				173,104	173,104
Mixed fish (dried)	Pounds	69,718				69,718
Miscellaneous Data.						
Fish meal	Tons	420	3,386	4,216	1,216	9,238
Fish oil	Gallons	19,093	557,460	346,883	28,452	951,888
Estimated value of pack		$533,768	$2,936,466	$7,898,734	$2,671,873	$14,040,841
Number of employees		366	1,015	2,605	1,076	5,062
Number of plants operated		25	16	20	9	70
Value of packing plants		$988,965	$1,261,193	$2,862,609	$960,750	$6,073,517

CALIFORNIA FRESH FISHERY PRODUCTS FOR YEAR 1922.

Compiled by Fish and Game Commission, Department of Commercial Fisheries.

Species of fish	Del Norte, Humboldt	Mendocino, Sonoma Lake	Marin	Solano, Yolo	Tehama, Colusa, Glenn	Sacramento, San Joaquin	Alameda, Contra Costa	San Francisco, San Mateo	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego, Imperial	Total	Mexican, brought into California
Albacore										236		11,769,022	18,092	1,444,473	13,231,823	
Anchovies								150,786		136,433		364,797		500	652,516	
Barracuda								81	517	13,031	103,214	3,675,366	9,433	919,806	4,721,448	1,528,770
Bluefish									4,201	45,135					49,336	
Boccaccio			26					66,785	185,833	764,345	1,250				1,018,239	
Bonito									13,500	2,106	11,600	816,025	60	39,852	883,143	45,922
Carp		1,795		5,338		12,422	35,456	11,902							66,913	
Catfish		123,204				2,232	243								125,679	
Chilipepper								30,012	121,993	64,050					216,055	
Cultus Cod	13,608	7,469	86					414,181	46,460	85,526	15	5		1,131	568,481	
Dolphin																
Eels														20	20	
Flounders	16,343		25	2,319			3,909	466,087	46,167	942	804	1,840		244	538,680	540
Grayfish							1,160	92,276						188,582	282,018	
Greenfish																
Hake								57,666	16,850						74,516	
Halibut	48,016	37,148	1,032					69,759	4,142	21,963	402,767	1,548,479	87,876	365,763	2,586,945	816,539
Hardhead						18,206									18,206	
Herring	6,222		12,650				70,345	259,887	1,000		517				341,621	
Kingfish							25	3,434	84,086	228,019	293	252,220	106	13,515	581,698	165
Mackerel									12,346	537,171	25,167	1,680,710	31,933	179,435	2,466,762	29,166
Marlin																
Mullet														24,364	24,364	6,582
Perch	68,479	70	31,974				61	46,252	6,798	20,741	402	57,474	1,103	4,280	237,634	6,142
Pike				74	153	2 481	4 249	487							7,444	
Pompano								1,659	33	448		13,688		222	16,050	372
Rock Bass											790	174,151	6,561	129,860	311,362	4,689
Rockfish	19,142	3,730						614,010	209,234	433,029	58,649	1,104,150	15,990	516,222	3,004,186	24,198
Sablefish								209,807	54,868	3,879					268,554	
Salmon	2,006,822	1,621,760	10,180	503,925	64,793	396,553	799,795	951,137	397,358	482,771	30				7,235,124	
Sandabs								1,020,778	132,794	3,645		13,497	265		1,170,979	
Sardines			125					170,390	1,990	44,676,589	190	46,062,068	1,360	2,487,188	93,999,900	
Sculpin												37,825	20	4,095	41,940	181
Sea Bass—Black											352	43,614	287	39,439	83,692	13,662
Sea Bass—White	68		19,191					29,232	44,016	597	46,899	1,721,864	29,508	291,047	2,182,422	722,302
Sea Trout	65							36				1,084	368	11,957	13,510	13 918
Shad				1,057		2,988	30,729	31,457							66,231	
Shad—Buck				41 338		72,931	213,101	176							327,546	

Shad—Roe				127,102		32,361	556,205									715,668	
Sheepshead											352	1,373		16,458		18,183	22
Skates								107,472	5,375	908	2,505	3,938	1,012			121,210	
Skipjack									11,149			5,189,872		4,914,691		10,115,712	1,746,670
Smelt	28,957	157	17,916				14,783	84,208	95,263	63,329	89,411	266,885	137,942	24,077		822,928	7,212
Sole	166							6,335,442	480,569	62,745	37,495	115,889	3,150	7,664		7,043,111	225
Splittail						9,194	1,214									10,408	
Striped Bass			1,481	70,911	270	92,212	352,562	166,759								684,198	
Stingaree																	
Suckers						1,318	4									1,352	
Surf Fish																	
Swordfish												21,361		1,895		23,256	
Tomcod								30,799	1,315							32,114	
Trout—Farm																	
Trout-Steelhead	2,490															2,490	
Tuna											2,065	668,019		1,806		671,890	20,462
Tuna—Bluefin												1,811,219		1,000,064		2,811,283	26,910
Tuna—Yellowfin												780,843		424,180		1,205,023	6,132,382
Turbot			784					750								1,534	
Whitebait	20,874		132					63,001								84,007	
Whitefish											390	24,944		2,445		27,779	2,491
Yellowtail											20,388	1,409,337	1,261	1,680,145		3,111,131	303,292
Miscellaneous	2,768		9	373			1,087	94,663	23,881	8,475	46,939	70,086	1,723	1,248		251,285	3,000
Total fish	2,234,020	1,795 333	95,611	752,440	65,216	642,928	2,084,928	11,572,431	2,001,741	47,656,113	852,484	79,701,636	348,050	14,766,668		164,569,599	11,455,814
Crustaceans:																	
Crabs (doz.)	5,959	582	1,250				82	27,871	101	2						35,847	
Ecrevisse																	
Shrimps			126,950				44,124	819,275								990,349	
Spiny Lobsters											64,298	158,697	17,504	135,811		376,310	640,466
Mollusks:																	
Abalones										1,504,943	18,451					1,523,394	37,040
Clams—Cockle	6,135	698	24,569									162				31,564	
Clams—Mixed	15,749	152	15,615				2,350	190			100	1,135				35,291	
Clams—Pismo									1,385		191,881					193,266	225
Clams—Softshell	516	3,519	80,890				196,962	61,375								343,262	
Cuttlefish	83		50					10,839	14,796	66,802	37	5,981				98,588	
Limpets																	
Mussels							2,724	9,256	185	6,055	155		25,497			43,872	
Oysters—Eastern			3,378,418													3,378,418	
Oysters—Native																	
Snails																	
Squid										121,103		22,772		62,766		209,641	
Miscellaneous:																	
Frogs							[1]100									100	
Terrapins					[2]75											75	
Turtles																	12,521
Totals	2,262,462	1,800,284	3,723,253		275		2,231,270	2,501,249	2,108,208	49,358,018	1,127,406	79,890,383	391,051	14,965,245		171,839,576	2,146,066

All amounts shown in pounds unless otherwise specified. Albacore and skipjack cleaned.
[1]20 dozen frogs. [2]5 dozen terrapin.

CALIFORNIA FRESH FISHERY PRODUCTS FOR YEAR 1923.

Compiled by Fish and Game Commission, Department of Commercial Fisheries.

Species of fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Solano, Yolo	Tehama, Colusa, Glenn	Sacramento, San Joaquin	Alameda, Contra Costa	San Francisco, San Mateo	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego, Imperial	Total	Mexican, brought into California
Albacore										149		8,514,349	754	3,972,947	12,488,199	26,634
Anchovies								184,085		85,016		37,973			307,074	
Barracuda								56		6,982	21,693	4,363,859	28,738	714,496	5,135,824	2,064,751
Bluefish									116,919	29,459					146,378	
Boccaccio	13							45,990	257,704	689,820	10,825				1,004,352	
Bonito								574		3,325	2,288	441,713	28	30,843	478,771	636,476
Carp		12,185		3,257		65,341	58,163	9,661							148,607	
Catfish		50,884		823		51,330	26,249								129,286	
Chilipepper								36,934	81,573	31,843					150,350	
Cultus Cod	13,112	6,562	332					321,542	28,693	93,677				3,382	467,300	47
Dolphin																
Eels														188	188	
Flounders	14,968		124	3,210			12,117	418,894	51,382	6,305		1,522		264	508,786	175
Grayfish								152,208	1,345			5,645		201,165	360,363	
Greenfish																
Hake								70,232	8,737						78,969	
Halibut	171,156	8,351	759					19,100	3,427	4,333	333,265	794,550	52,719	157,039	1,544,699	882,138
Hardhead						9,563									9,563	
Herring	3,341		28,035				66,087	269,785	188					16,514	383,950	
Kingfish								735	50,848	110,207	26	230,900		10,719	403,435	8,129
Mackerel								74	944	570,371	13,012	2,654,317	96,408	218,828	3,553,951	38,495
Marlin																
Mullet												503		9,504	10,007	64,218
Perch	43,317		23,148	108			97	63,287	1,884	22,502	980	135,270	959	34,497	326,049	33,633
Pike				111		647	3,772	94							4,624	
Pompano								618	187	106		15,541	10	3,318	19,780	13,138
Rock Bass											2,041	203,157	6,921	115,920	328,039	29,230
Rockfish	5,851	1,609	3,037					483,395	220,284	746,812	57,583	1,342,561	52,824	863,692	3,777,648	17,894
Sablefish								198,590	329,238	10,464					538,292	
Salmon	1,990,235	812,867	31,129	475,812	68,964	477,526	1,221,643	1,283,748	306,336	422,000					7,090,260	
Sandabs								1,220,604	130,215	2,082	133	10,632	245		1,363,911	
Sardines								339,804	275	85,022,672	1,060	67,493,419	775	5,301,351	158,159,356	
Sculpin												41,623	59	15,784	60,466	
Sea Bass—Black											2,703	35,405	839	36,793	75,740	151,255
Sea Bass—White			6,020					16,555	2,449	690	149,870	1,370,096	14,428	218,555	1,778,663	560,962
Sea Trout										38				3,307	3,345	30,915
Shad				1,565		4,912	37,099	28,470	49						72,095	
Shad—Buck				47,266		23,163	333,331	27							403,787	
Shad—Roe				110,248		38,148	661,100	5							809,501	

Sheepshead												289	5,979	76	24,767	31,111	517
Skates									127,224	2,507	990		3,019	188	60	133,988	
Skipjack													3,175,769		1,403,308	4,579,077	6,883,445
Smelt	32,166	2,765	42,104				82	109,934	62,210	7,140	69,200		334,796	120,795	17,648	798,840	7,540
Sole	10,153		182				270	6,174,114	642,785	54,275	73,842		113,931	3,388	12,145	7,085,085	950
Splittail						13,156	800									13,956	
Striped Bass			2,593	78,030	119	141,342	581,870	105,508		111						909,573	
Stingaree													365			365	
Suckers						342										342	
Surf Fish																	
Swordfish													6,277		4,779	11,056	635
Tomcod			424					37,868	3,475							41,767	
Trout—Farm																	
Trout—Steelhead	3,011															3,011	
Tuna													427,151	15		427,166	235,204
Tuna—Bluefin													1,818,337		1,399,753	3,218,090	
Tuna—Yellowfin													322,987		105,909	428,896	10,408,029
Turbot	20		766					225								1,011	
Whitebait	25,290		1,051					40,607		870						67,818	
Whitefish													26,099	595	7,809	34,503	5,405
Yellowtail												3,001	1,356,643	2,748	1,606,204	2,968,596	1,094,012
Miscellaneous	1,469	4,700		1,482		204	1,332	43,304	14,019	5,462	13,470		79,707	440	4,456	170,045	13,784
Total fish	2,314,102	899,923	139,704	721,912	69,083	825,674	3,004,012	11,803,851	2,317,673	87,927,701	755,281		95,367,095	383,952	16,515,944	223,045,907	23,207,611
Crustaceans:																	
Crabs	[1]254,640	[2]6,480	[3]16,776				[6]3,552	[7]786,936	[8]4,848	[10]2,568						[11]1,075,800	
Ecrevisse																	
Shrimps			418,773					694,585								1,113,358	
Spiny Lobsters												75,583	158,168	25,206	125,424	384,381	708,477
Mollusks:																	
Abalones			40						15	1,532,757	22,322					1,555,134	32,599
Clams—Cockle	5,538	20	23 145										7,414			36,117	
Clams—Mixed	14,551		10,497													25,048	797
Clams—Pismo									720		237,228					237,948	
Clams—Softshell		530	78,560				145,231	58,774								283,095	
Cuttlefish			219					9,877	42,134	57,823			169			110,222	
Limpets																	
Mussels			230				477	9,409	50	4,665	95			45,100		60,026	
Oysters—Eastern			[4]451,367					[8]236,736								[12]688,103	
Oysters—Native																	
Snails																	
Squid										1,098,510			76,630		925	1,176,065	4,381
Miscellaneous:																	
Frogs (doz.)																	
Terrapins						[5]1,128										[13]1,128	
Turtles									960							960	3,097
Totals	2,588,831	906,953	1,139,311	721,912	69,083	826,802	3,153,272	13,600,168	2,366,400	90,621,024	1,090,509		95,609,476	451,258	16,642,293	229,793,292	23,956,962

All amounts shown in pounds unless otherwise specified.

[1]10,610 dozen. [2]270 dozen. [3]699 dozen. [4]2,051,668 shell oysters. [5]47 dozen. [6]148 dozen. [7]32,789 dozen. [8]1,076,075 shell oysters. [9]202 dozen. [10]107 dozen. [11]14,825 dozen. [12]3,127,743 shell oysters. [13]17 dozen.

NATIVITY OF COMMERCIAL FISHERMEN LICENSED APRIL 1, 1922, TO MARCH 31, 1923.

Native of	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Solano, Yolo	Tehama, Colusa, Glenn	Sacramento, San Joaquin	Contra Costa, Alameda	San Francisco, San Mateo	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego, Imperial	Miscellaneous	Total
Austria				1		3	6	1		9	1	296		9		326
Canada	1	1		1	1	1					3	2		3		13
China			1			1	6	21		3						32
Dalmatia						1	3			1		81		14		100
Denmark	1	6	8	1	1	3	4	2		1	1	13		7		48
England	1		1					2	1	1	2	5		3		16
France		3	1			1				3		4				12
Finland	16	30						1		4	1	1				53
Germany	2	6	2	1		10	1	3	4	5	3	6		4		47
Greece			4	46		12	7	2		2	1	3		3		80
Holland												1				1
Hungary												1	1			2
Ireland				1												1
Italy	11	1	2	42		3	192	262	29	154	8	162		168		1,034
Japan						9				85	4	731		149		978
Mexico														9		9
Norway	5	6		2		3	2		1	4	6	38		4		71
Poland						1	1									2
Portugal	3	8	1	25		13	4	2	1	13	10	44		44		168
Russia		1	2			1		2	1	2	1	42		2		54
Scotland											1	6		2	1	10
Slav										2		24		3		29
Spain		2					1	2		21	1	1		3		31
Sweden		5	2	4		3	2	3	1	1	2	22		15		60
Switzerland	1								1				1	1		4
Turkey												1				1
United States	168	138	33	56	100	62	57	49	24	33	85	191	9	131	9	1,145
Miscellaneous and unaccounted for							2			1	3	3		3	133	145
Totals	209	207	57	180	102	127	288	352	63	345	133	1678	11	577	143	4472

NATIVITY OF COMMERCIAL FISHERMEN LICENSED APRIL 1, 1923, TO MARCH 31, 1924.

Native of	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Solano, Yolo	Tehama, Colusa, Glenn	Sacramento, San Joaquin	Contra Costa, Alameda	San Francisco, San Mateo	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego, Imperial	Miscellaneous	Total
Austria			1	1	1	4	1			9		212	1	3		233
Canada	2					1	6				1	4	1	2		17
China							3	24		1					1	29
Dalmatia						1	1	2				91		14		109
Denmark	2	3	5			2					1	17	2	7		39
England					1		1	5	2		1	6		4	1	21
France		1	1							2		3				7
Finland	9	26						3			1	6		1		46
Germany	3	1	2	2		8	3	3	3		2	7	1	6		41
Greece	1		3	37		10	8	2				4		4		69
Holland							1							1		2
Hungary													2			2
Ireland	1			1		1					1			1		5
Italy	9	3	2	33		3	187	232	24	229	8	129	1	155		1,015
Japan				1		20				65	3	728		124		941
Mexico														3		3
Norway	2	4		1		2		1	2			39		2		53
Poland						1					1	3				5
Portugal		4	1	23	2	4	9	2		7	7	41		51		151
Russia						1		3		1		30	1			36
Scotland	1								1		2					4
Slav												20		3		23
Spain		5						3		43		3		5		59
Sweden	1	5	2	4		4	2	5	6	3	3	13	2	15		65
Switzerland									1	1		1	1			4
United States	191	68	19	46	42	58	57	38	18	72	94	148	27	141	13	1,032
Wales	1										2					3
Miscellaneous and unaccounted for										2	1	12		3	88	106
Totals	223	120	36	149	46	120	279	323	57	435	128	1,520	39	515	103	4,123

LION BOUNTIES.

Statement of Lion Bounties Paid by the Fish and Game Commission from January 1, 1922, to December 31, 1923.

	1922	1923	Total since 1907
Alameda	--	1	2
Alpine	--	--	1
Amador	2	--	11
Butte	1	--	34
Calaveras	--	1	17
Colusa	2	1	21
Del Norte	4	2	107
El Dorado	7	3	78
Fresno	2	3	35
Glenn	10	1	60
Humboldt	14	10	623
Imperial	--	--	2
Inyo	--	4	12
Kern	17	22	193
Kings	--	--	1
Lake	21	21	169
Lassen	--	--	9
Los Angeles	5	3	76
Madera	--	1	41
Mariposa	7	5	99
Mendocino	22	9	278
Merced	--	--	3
Modoc	--	--	4
Mono	1	--	11
Monterey	16	17	157
Napa	--	--	3
Nevada	--	--	7
Orange	--	--	9
Placer	--	5	64
Plumas	1	--	10
Riverside	--	2	45
Sacramento	--	--	1
San Benito	2	3	42
San Bernardino	4	3	38
San Diego	--	1	48
San Joaquin	--	--	2
San Luis Obispo	13	10	120
San Mateo	--	--	1
Santa Barbara	26	13	158
Santa Clara	1	11	37
Santa Cruz	--	2	4
Shasta	37	16	330
Sierra	--	--	6
Siskiyou	14	5	271
Sonoma	1	--	25
Stanislaus	--	--	10
Sutter	--	--	2
Tehama	14	4	212
Trinity	19	11	324
Tulare	22	15	172
Tuolumne	13	11	118
Ventura	1	8	61
Yuba	--	1	5
Totals	299	225	4,169

FINANCIAL STATEMENT.

Comparative Statement of Income for the Fiscal Years 1922-23 and 1923-24.

	1922-23	1923-24
License sales—		
Hunting	$249,511 00	$251,182 00
Angling	217,038 00	191,252 00
Market fishermen	46,510 00	43,730 00
Wholesale fish packers	1,170 00	1,245 00
Fish breeders	40 00	75 00
Fish importers	5 00	
Trapping	3,119 00	2,596 00
Game breeders	152 50	232 50
Kelp	10 00	
Total license sales	$517,555 50	$490,312 50
Other income—		
Court fines	$30,803 00	$52,748 85
Fish packer's tax	38,033 44	51,921 01
Fish tag sales	3,111 09	4,804 99
Game tag sales	7 01	60 81
Crawfish inspection	210 00	10 00
Abalone inspection		235 00
Interest on bank deposits		463 75
Sales of nets	140 00	27 00
Sale of launch	60 00	
Sale of typewriter	22 50	
Sale of catfish		100 00
Sale of automobiles		375 00
Sale of deer hides		41 00
Sale of two cabins		70 00
Total other income	$72,387 04	$109,857 41
Total income	$589,942 54	$600,169 91

STATEMENT OF EXPENDITURES FOR THE PERIOD JULY 1, 1922, TO JUNE 30, 1923, OF THE SEVENTY-FOURTH FISCAL YEAR.

Function	Materials and supplies	Salaries and wages	Service and expense	Property and equipment	Total
Administration—					
Commissioners			$546 35		$546 35
Executive offices	$346 32	$16,173 20	5,737 46	903 78	23,160 76
Printing			4,149 13		4,149 13
Research and publicity	226 71	4,339 27	695 28	370 00	5,631 26
Accident and death claims			2,702 43		2,702 43
Department totals	$573 03	$20,512 47	$13,830 65	$1,273 78	$36,189 93
Commercial Fish Culture and Conservation—					
Superintendence	$137 24	$10,381 58	$5,398 05	$219 37	$16,136 24
Inspection and patrol	4,694 25	21,798 19	6,756 84	194 74	33,444 02
Research	200 65	17,204 28	2,166 35	314 13	19,885 41
Statistics	676 02	4,698 87	158 51	5 25	5,538 65
Market fishing license commissions			482 00		482 00
Propagation and distribution of salmon	6,674 27	14,033 92	988 80	594 50	22,291 49
Department totals	$12,382 43	$68,116 84	$15,950 55	$1,327 99	$97,777 81
Sporting Fish Culture and Conservation—					
Superintendence	$362 62	$10,286 31	$29,828 78	$6 25	$40,483 96
General patrol (40 per cent.)	1,067 36	48,185 27	31,126 46	268 93	80,648 02
Propagation and distribution of trout	26,730 12	61,740 16	23,498 76	5,938 80	117,907 84
Department totals	$28,160 10	$120,211 74	$84,454 00	$6,213 98	$239,039 82
Game Conservation—					
Superintendence		$1,528 06	$36 564 91		$38,092 97
General patrol (60 per cent.)	$1,601 04	72,277 90	46 89 69	$103 39	120,972 02
Department totals	$1,601 04	$73,805 96	$83,254 60	$103 39	$159,064 99
Tahoe camping ground	$120 82	$659 25	$19 08		$799 15
Grand totals	$42,837 42	$283,306 26	$197,508 88	$9,219 14	$532,871 70

STATEMENT OF EXPENDITURES FOR THE PERIOD JULY 1, 1923, TO JUNE 30, 1924, OF THE SEVENTY-FIFTH FISCAL YEAR.

Function	Materials and supplies	Salaries and wages	Service and expense	Property and equipment	Total
Administration—					
Commissioners			$429 59		$429 59
Executive offices	$346 95	$15,489 97	5,763 43	$36 80	21,637 15
Printing	7,253 52				7,253 52
Research and publicity	67 17	4,375 00	807 25	97 20	5,346 62
Accident and death claims			569 04		569 04
Department totals	$7,667 64	$19,864 97	$7,569 31	$134 00	$35,235 92
Commercial Fish Culture and Conservation—					
Superintendence	$236 99	$7,495 00	$2,729 13		$10,461 12
Inspection and patrol	2,221 31	20,943 23	4,977 90	$13 37	28,155 81
Research	608 22	12,290 81	2,102 20	100 49	15,101 72
Statistics	616 35	5,078 38	80 83		5,775 56
Propagation and distribution of salmon	6,478 11	11,424 96	1,145 02	41 98	19,090 07
Department totals	$10,160 98	$57,232 38	$11,035 08	$155 84	$78,584 28
Sporting Fish Culture and Conservation—					
Superintendence	$63 26	$9,957 25	$2,415 36	$0 75	$12,436 62
Printing	61 20				61 20
Propagation and distribution of trout	23,559 07	52,425 58	8,948 28	122 16	85,055 09
Department totals	$23,683 53	$62,382 83	$11,363 64	$122 91	$97,552 91
Patrol and Law Enforcement—					
Prosecutions and allowances			$188 35		$188 35
General patrol	$1,376 11	$117,499 16	78,261 14	$4 16	197,140 57
Department totals	$1,376 11	$117,499 16	$78,449 49	$4 16	$197,328 92
Fish and Game Conservation—					
Mountain lion hunting		$1,500 00	$767 82		$2,267 82
Mountain lion bounties			6,140 00		6,140 00
State Fair exhibit	$175 77	241 92	688 56		1,106 25
Department totals	$175 77	$1,741 92	$7,596 38		$9,514 07
License commissions			$45,906 90		$45,906 90
Tahoe camping ground	$62 95	$813 00	7 25		883 20
Grand totals	$43,126 98	$259,534 26	$161,928 05	$416 91	$465,006 20

Comparative Balance Sheets at Beginning and End of Each of the Seventy-fourth and Seventy-fifth Fiscal Years.

	July 1, 1922	June 30, 1923	June 30, 1924
Debits.			
Available appropriated fund			$11,630 49
Warrants receivable	$28,936 62	$47,587 34	67,327 79
Cash, state	137 00	3,602 00	17,911 75
Fish and Game Preservation Fund	35,000 85	87,536 87	209,345 47
Accounts receivable		1,069 82	115 18
Bond deposits (licenses sold to agents)	41,591 00	52,206 00	71,670 00
Unissued licenses available	401,030 00	435,841 50	532,422 00
County clerks unissued license supplies	285,770 00	271,010 00	292,967 00
Fish tags			3,261 41
Game tags			320 13
Revolving fund	500 00	500 00	
Total debits	$792,965 47	$899,353 53	$1,206,971 22
Credits.			
Appropriation for support			$1,012 92
Deficiency appropriation for salaries			102 00
Deficiency appropriation for support			10,515 57
Claims filed	$28,936 62	$47,587 34	67,327 79
Accumulated excess income	35,137 85	92,208 69	227,372 40
Liability for bond deposit	41,591 00	52,206 00	71,670 00
Accountability for licenses	686,800 00	706,851 50	825,389 00
Accountability for fish tags			3,261 41
Accountability for game tags			320 13
Revolving Fund liability to Board of Control	500 00	500 00	
Total credits	$792,965 47	$899,353 53	$1,206,971 22

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